ELECTRICAL REVIEW

19th JUNE, 1953

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ELECTRICAL REVIEW

19th JUNE, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLII • NO. 25

Pursuit of Prosperity

LOOKING back over the last generation or so, it seems that we have been chasing prosperity for a very long time. The conditions under which business has had to be done have varied from the price-cutting methods of the early years to the organized and regulated prices so prevalent to-day. Two wars have deprived Britain of her reserves, and we now have to pay, with manufactured goods, as we go. There are no dividends to be drawn in food or goods, and it is necessary for our exports to be both outstanding in quality, and cheaper than those offered by competitors. Successive Governments have emphasized the need for exports, but the need for a brisk home market has not been appreciated to the same extent. This state of things is not new, for when imports were free and unrestricted, agriculture and manufacturing were in a bad way. The home market, both for food and what are now called "consumer goods," was flooded with imports, and merchants were more prosperous than producers.

In the electrical industry machinery and apparatus have been imported to only a minor extent for many years, and it has been found that our own manufacturers have not only met home demands with satisfactory goods at reasonable prices, but have raised the export of electrical products to the second highest position in all industry.

Yet it is a commonplace that we are only beginning to make our way out of a difficult position, that we have very far to go, and that it will take a long time before we can rightly consider ourselves prosperous. Mr. Graham Hutton has written a book "We too can Prosper: The Promise of Productivity," and it is well that it should be realized that there is no need for despair. Yet there is little in it that is new, for has not this journal for many years pointed out the necessity for more productive working, for an active selling policy backed by keen, farsighted and expert salesmanship? And when he urges the necessity for "adequate buildings, plant and

productive capital equipment, intensively used, and kept up-to-date by replacement," what is he doing but pointing out that the policy (again of successive Governments) of depriving industry of the capital needed must lead sooner or later to stagnation and bankruptcy, and that it must be radically changed without delay?

LOAD BALANCING

Although the Power Convention papers dealt with the rôle of electricity in production, industrial and agricultural, it was not allowed to be forgotten that an economic supply—economic to the consumers and the supply authorities alike—can be attained only by a balance between industrial, commercial and domestic demand. Plant shortage has obscured this truism for some years, with detrimental effects to the supply authorities and the consumers, but now the shortage is well on the way to being overcome and some endeavour to procure a balance by fostering the domestic use of electricity is permissible. Cooking and water heating are the best media for filling up the load-curve valleys and they are the subjects of a new series of advertisements, bearing the general slogan "Electricity a Power of Good," which the British Electrical Development Association is inserting in all the major national magazines. These advertisements will not only arouse public interest anew, they will also stimulate electricity sales staffs who have been so long suppressed.

CREATING CONFUSION

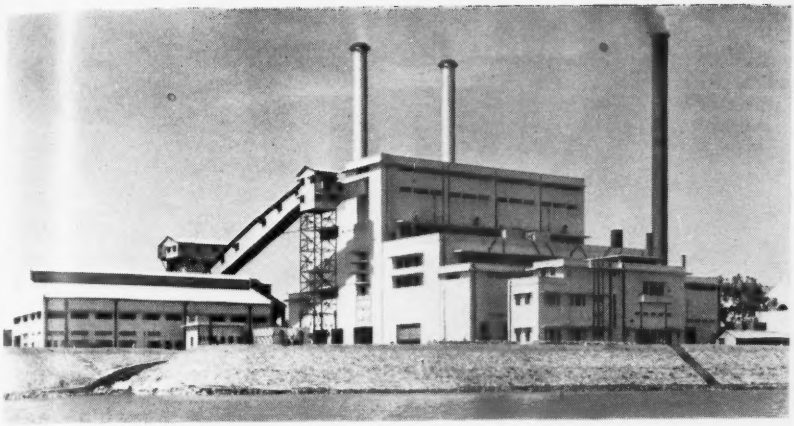
A correspondent considers that reports which appeared in the daily papers on Tuesday last week support the contention of the *Electrical Review* that the present title of the British Electrical Power Convention tends to suggest that the Convention is a B.E.A. affair. The reports were of remarks made by Lord Citrine "at a British Electricity Authority conference at Torquay." This is perfectly true but the inevitable conclusion of the uninitiated is that it was all a part of the ensuing Power Convention. It is convenient, of course, for the B.E.A. to hold its own conference while its people are gathered for the Power Convention but could it not be held when the latter was over? If necessary the Convention proceedings could begin on the Monday evening, instead of Tuesday, to give the B.E.A. a clear Friday.

MANUFACTURING OVERSEAS

A report summarized in our 5th June issue showed the extent to which South Africa was supplying her own electrical needs, largely with the aid of British firms which have established factories in the Union. The question of the desirability of British manufacturers pursuing this course was raised at the Power Convention "Forum" last Friday when it was agreed that conditions nowadays dictated such a policy, the alternative being to lose the business altogether. In effect, of course, we are thus "exporting employment" and the only possible way of avoiding this is to export the people who will be put out of work unless sufficient trade is secured elsewhere in the world. But this is a Draconian solution not easy to apply.

PUBLIC LIGHTING METHODS

Covering a total of 345 local authorities in England, Scotland and Wales, a survey recently carried out by the Institution of Municipal Engineers can be considered a fairly comprehensive review of modern street lighting practice. Rural District Councils, however, did not come within the scope of the investigation; had they done so the proportion of electric lamps in service (60·31 per cent) would have been greater. For future Group A installations more authorities indicated a preference for sodium lighting than for other forms.



Delhi "B" Power Station

State Electricity Board's New Plant

THE new "B" power station of the Delhi State Electricity Board, which was officially opened by the Minister for Irrigation and Power of the Government of India, Shri Gulzari Lal Nanda, in December, 1952, is at Rajghat, in New Delhi, adjacent to the existing station which was formerly owned by the Delhi Central Electric Power Authority, Ltd., before being taken over in 1951 by the Board.

The demand in New Delhi, which is the seat of the Indian Government, rose from 8,500 kW in 1940 to 28,500 kW in 1951. An unusual feature of the m.d. is that the midsummer figure is as great as the one in midwinter. In former times the Government offices were vacated in summer for the cooler climate of Simla. The move ceased during the recent war so that the summer m.d. has increased because of the greater population during the summer and the consequent use of air conditioning.

Messrs. Merz & McLellan reported to the D.C.E.P.A. in 1944 on the power supply position and recommended the provision of a new station alongside the existing one with accommodation for three sets, but arranged for further extension on the land occupied by the old plant. Merz & McLellan were subsequently appointed to act as consulting engineers and to proceed with the construction of a new 20 MW station.

The new station is on the west bank of the River Jumna and is founded on river alluvium in the form of a fine micaceous sand overlaid by 9ft of a fill made up of coal, ash, clay and rubble. The surface material is very soft; the sand strata is completely waterlogged and is practically silt-free. The foundation consists of a reinforced concrete slab 2ft 6in thick supported on 20in diameter Franki cast-in-situ piles, sunk well into the fine sand.

All main buildings were founded on piles as described, except the coal handling plant, which comprises a wagon tippler and manual unloading bunkers at ground level feeding a bucket conveyor running below them. This structure was formed

The Delhi "B" power station shown above from the River Jumna, looking north west, with chimney of old "A" station to the right

of three 30ft square reinforced concrete monoliths joined together by tunnels through which the bucket conveyor passes. The intake pumphouse for the condenser circulating water system was formed in a steel sheet pile cofferdam some 90ft out into the river and, since its construction, a new river wall has been built lining up with the front face of the pumphouse as part of a river training scheme to retain the deep water channel of the river against the face of the power station site.

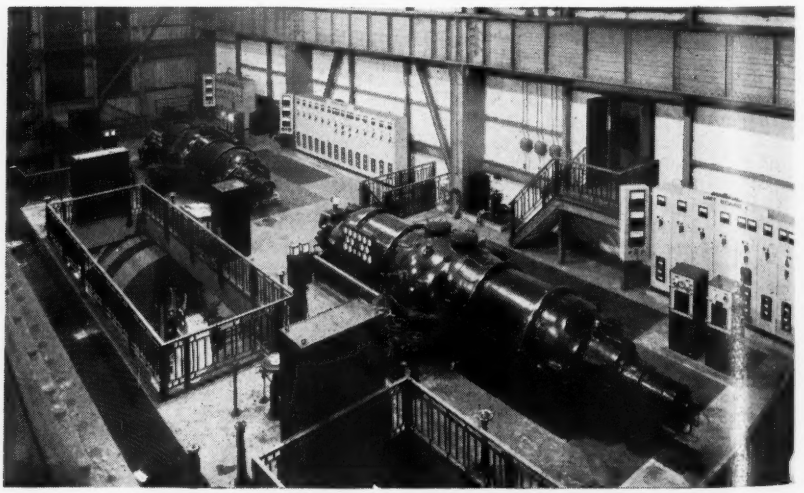
In the boiler house there are four units arranged in a single line parallel to the turbine house with the coal bunkers and firing aisle in between the two houses. Each boiler has its own bunker of 175 tons capacity and the boiler house has a temporary wall at one end for future extensions. The boilers are of the B. & W. three-pass vertical header type with a single drum and economizers, each having a m.c.r. of 80,000 lb/hr and an economical output of 64,000 lb/hr when the superheater outlet conditions are 425 lb/sq in and 775 deg F, from feed water at 210 deg F. The guaranteed efficiency on the net calorific value of the coal is 87 per cent. The furnaces are of the completely water-cooled Bailey wall type. Three-loop self-draining horizontal superheaters are provided, all the economizers being of the flash welded plain tube type.

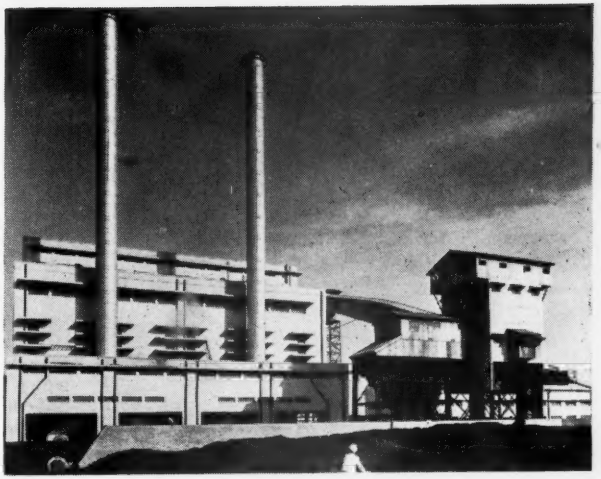
Each boiler has a single stoker 15ft wide and 18ft long with a centre diaphragm type of air control. This enables the air supply to the rear half of the grate to be considerably restricted at will in that area of the grate where combustion is practically completed and to permit the supply of more air at greater pressure to the front of the grate. Lea coal meters measure the quantity of coal consumed by each boiler. Single induced and forced draught fans are provided for each boiler as well as two secondary air fans. The dust extracting equipment is of the Davidson shunt suction type and consists of a primary collector and secondary cyclone for each boiler. The ash from the clinker hoppers is discharged into tipping trucks through water-immersed paddle ash extractors.

Each pair of boilers discharges into a common chimney. The two chimneys are self-supporting, 180ft high and of 8ft 6in diameter. The inside surface is lined with 1½in of gunite to protect the metal surfaces against corrosion.

In the turbine house there are two 10 MW c.m.r. turbo-alternators, each having an economical rating of 8 MW. Each machine, which is connected to a condenser

General internal view, showing two Stal-A.S.E.A. 10,000 kW turbo-alternators and part of the auxiliary switchgear





View from the west, showing steel chimneys and coal handling plant

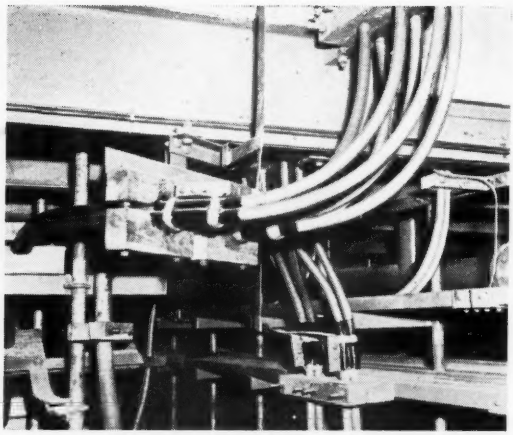
of 11,800 sq ft surface area, is of the radial flow, double rotation, multi-disc Ljungström type, manufactured in Sweden and supplied by A.S.E.A., Ltd., of London. The counter-rotating turbine elements normally run at 3,000 r.p.m. and are solidly coupled to the rotors of the two "half-rating" alternators, which generate at 11,000 V and 50 c/s.

The steam conditions at the turbine stop valves are 400 lb/sq in and 750 deg F. After passing through the main isolating valve the steam enters a strainer and then goes through the emergency stop valve and governor valve to the steam inlet. The latter is trifurcated inside the turbine casing to equalize admission of steam to the "steam chest" which forms an annular space around the shaft of one turbine element. From the chest, the steam passes through openings in the hub of one of the blade discs to the inner ring of blades and thence radially outward through the counter-rotating blade system, this first pass consisting of 15 rings of blades on each shaft. Having completed its outward course the steam is turned through 180 deg and passes radially inward through the next set of blades, consisting of 10 rings, and is then turned once more through 180 deg and again passes radially outward through 16 rings of single-tier and six rings of double-tier blades, which form the final set of radial flow blade rings. When the steam reaches the outer diameter of this radial pass, it is divided by a system of stationary guide blading, carried in a housing ring supported from the turbine casing, and caused to flow axially out towards each end of the machine through a single stage of axial blading. An overload valve permits some of the steam in the chest to by-pass the first two sets of radial flow blading and be admitted directly to the inlet of the third and final set of radial blade rings.

Steam for feed heating is extracted from the turbine at two points in the last radial pass (after the 32nd and 41st rings of blading). Evaporator steam is also taken from the 32nd ring of blades. A saturated steam connection from the boilers is provided for blade washing. An "aerotemper" is provided to blow warm air through the blade system, when standing, to avoid "sweating" and corrosion.

Each pair of "half-rating" alternators has one main and one pilot exciter. The main exciter is coupled to one alternator and the pilot exciter to the other. Each "half-rating" alternator is provided with its own self-contained closed-circuit air cooling system, the cool air being driven towards the centre of the machine along the air gap and stator core air ducts by an axial fan mounted on the rotor shaft at the slip-ring end. The hot air passes through coolers below the machines supplied with cooling water from the circulating water system. A breather filter is provided in the main air duct after each air cooler. Air is also drawn off from the pressure side of each alternator fan to seal the turbine and alternator bearings.

Provision is made for operating the machines on open air circuit cooling under emergency conditions. An aerotemper circulates warm air through the alternator to prevent condensation after the machines have been shut down or if they are left



Transformer cables from switchgear entering basement

standing for long periods when the atmospheric humidity is high. The main exciter has its own cooling air circuit fans, drawing in air through a filter and discharging into the turbine house. The pilot exciter requires no special cooling.

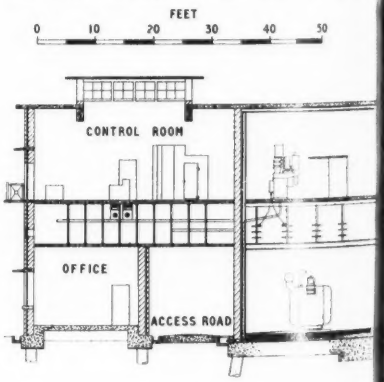
The condensers are guaranteed to maintain an absolute back pressure of 2·25in Hg when dealing with 69,500 lb/hr of steam and when supplied with 9,000 gall/min of circulating water at 85 deg F. The 3,648 condenser tubes are of Admiralty mixture; they are secured to the tube plate at their inlet ends by roller expanding and at the outlet ends in tube plate glands with lipless ferrules, the glands consisting of two metallic and one fibre rings, inserted into the gland space in that order. Each condenser has divided water flows to permit one half to be cleaned while the other half is in service. Each machine has one main two-stage ejector, one single-stage quick starting ejector and one extraction pump.

The feed system is of the closed type with overflowing hotwells. There is one high- and one low-pressure feed heater as well as a drain cooler. Make-up water for the boiler feed is distilled by the bled steam evaporators. River water is pumped to settling tanks, whence it passes through filters to a softening plant of the accelerated reaction type for a maximum duty of 3,600 gall/hr; after softening it passes through filters to storage tanks before being used as raw feed for the evaporators.

There are four feed pumps, three driven by motors and one by a steam turbine, the former having a capacity of 125,000 lb/hr and the latter 129,000 lb/hr. The motor driven pumps are of the eight-stage centrifugal type, operating at 2,960 r.p.m., and each is driven by a 155 h.p. motor. The steam driven pump is of the two-stage centrifugal type operating at 5,800 r.p.m.

For the condenser circulating water system mechanical draught cooling towers have been adopted because of difficulties experienced in the past in securing an adequate supply of water from the river, which has been found to deviate from its course in dry weather. The system is arranged to be extensible for three further 10 MW machines. The present installation incorporates three vertical spindle single-stage centrifugal pumps each of 9,800 gall/min capacity at 50ft head, each pump being capable of supplying the full load water requirements of one machine. The pumps are arranged in a separate building adjacent to the cooling towers and are designed so that they are below the cooling tower pond level. The pumps take water from the tower ponds and discharge it through 40in bore cast iron pipes to concrete culverts, below the turbine house foundations, which supply the condensers.

The forced-draught tower consists of two



adjoining banks, each of five cells, with the pond divided into two sections so that either half can be emptied or cleaned out without entirely shutting down the tower.

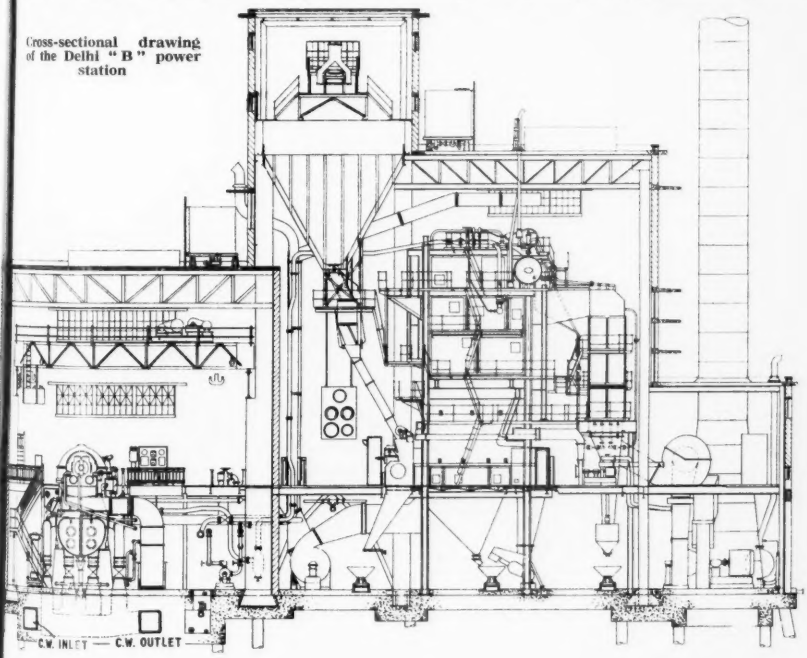
The tower is designed to cool 19,500 gall/min from 95·7 to 85 deg F when the wet bulb temperature is 70 deg F at the tower inlet. Pre-cast concrete blocks and slabs were used for the tower shell and fan housing framework. The ponds are of reinforced concrete with a sloping bottom towards the inlet penstocks of the circulating water pump suction pit. The " fill " of the tower, with the irrigation system and spray eliminators, was supplied from America in Californian redwood.

There is one 12ft diameter forced draught fan per cell driven by a motor of 24·5 b.h.p. at 1,465 r.p.m., through a 4 : 1 ratio gearbox. Each fan has four monel metal adjustable pitch blades and the air quantity delivered by each fan, when the air has a density of 0·0725 lb/cu ft, is 191,700 cu ft/min.

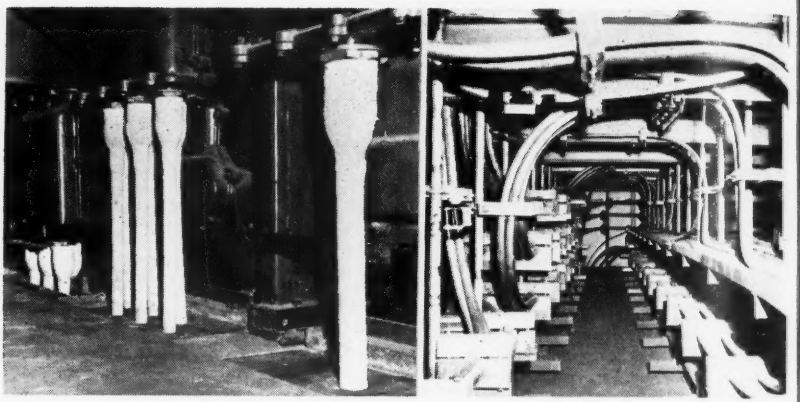
The water required to make good the losses from the cooling system by evaporation, driftage and purging, is supplied from the river by two pumps, each of 1,400 gall/min. The circulating water chlorinating plant is of the intermittent automatic injection type having a maximum capacity of 6,000 lb of chlorine per 24 hours. The injection is made into the circulating water pipes leading to the condenser.

Mechanical coal handling plant serves the new power station and in addition augments the arrangements for the existing plant. The new plant, which handles Indian broad gauge railway trucks, consists of a side discharge wagon tippler and twin manual unloading hoppers feeding into a g.b. conveyor. The latter in turn feeds either a radial conveyor, for the discharge of coal to a drag scraper storage area, or a belt conveyor system either to the new boiler house or to a storage bunker from which coal is discharged into tipping trucks running on a 2ft 6in gauge track for supply to the old station. A coal crusher is provided to deal with run-of-mine coal. The capacity of all of the conveyors is 80 tons an hour.

Sequence control is provided to safeguard the plant from mal-operation or accidental outage. The drag scraper plant is operated



Cross-sectional drawing of the Delhi " B " power station



Fireproofing of 11 kV cables leading into switchgear terminal boxes and (right) various l.v. cables in the cable chamber

from a central control tower and consists of a single reversible bucket actuated by wire ropes from a winch. The tail car can be remotely operated from the control cabin by a system of overhead wires and collector shoes on the tail car. The coal store is designed to hold 8,500 tons with a depth of 6ft. The ash, dust and grit from the boilers are handled by tipping trucks.

The two turbo-alternator sets which generate at 11 kV are connected directly to the main 11 kV switchboard in the switchroom, forming an annexe to the turbine house. Supplied from this 11 kV switchboard there are two 10 MVA transformer interconnectors to the "A" station and various 11 kV feeders to substations supplying local loads.

The main station auxiliaries for each turbo-alternator are fed from unit switchboards which normally receive their input at 400 V through unit transformers solidly teed off the connections between the generators and the 11 kV switchboard. Because the twin alternators are paralleled at the switchboard the tee is made at this point.

The less vital station auxiliaries, the non-urgent station auxiliaries and all general apparatus are supplied from a station switchboard, the two sections of which are each fed at 400 V from a station transformer. The station transformers are connected on the h.v. side through circuit breakers to the main 11 kV switchgear. The starting-up and alternative supplies for the 400 V unit switchboards are obtained from the station switchboard.

The control room is in the administrative block adjoining the electrical annexe and contains the control and relay panels for the generators and feeders, the automatic voltage regulators, the metering equipment and the generator control desk.

Each generator neutral is connected through a circuit breaker and each interconnector transformer through an isolator to a neutral busbar which in turn is connected to earth through a resistance. The neutral point of each station and unit transformer is connected to earth through an isolator and a fuse, a single lamp being provided to indicate earth faults.

A 230 V d.c. system is provided for the control, indication and emergency lighting supplies; it is arranged as a ring main supplied from a trickle charged lead-acid battery.

The interconnector transformers are rated at 10 MVA; the station units at 1·5 MVA; the unit transformers at 1 MVA and the lighting transformers at 200 kVA.

The switchgear consists of 350 MVA double busbar oil filled metalclad gear, the main busbars being divided into two sections by a section switch with a busbar coupling switch between the main and reserve busbars. The 11 kV switch house with its cable chamber is above the transformer chambers in the electrical annexe, the switch house being divided into three by fireproof doors. Each section occupies a

separate room with the section switch in the third control chamber.

The auxiliary switchgear is of the single busbar air break type with a rupturing capacity of 25 MVA. The station and unit boards are in the electrical annexe at the same floor level as the 11 kV switchgear and are normally electrically remote controlled from panels on the operating floor of the turbine house. The boiler boards are in the boiler house at firing floor level and are remotely controlled from their respective boiler instrument panels.

Except where high ambient temperatures required the use of mineral insulated cables (some 8,700 yd) all the cable was supplied by Henley's who also carried out the complete erection work. In aggregate approximately 14½ miles of cable were supplied.

The main circuits from the generators and transformers are single-core cables laid in close trefoil formation secured by cleats. Much of the other cabling is on adjustable trays and clearance has been allowed between adjacent power circuits for adequate ventilation and access for inspection and maintenance. In the cable chambers under the switch house and control room all combustible servings have been removed from the cables to minimize fire hazards.

We are indebted to the Delhi State Electricity Board for permission to publish this article and to Messrs. Merz & McLellan (India) for their assistance in preparing it.

PRINCIPAL CONTRACTORS

ASEA ELECTRIC, LTD., turbo-alternators, condensers and feed heating plant. ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, fan motors for cooling tower. W. & T. AVERY, LTD., concrete testing equipment. BABCOCK & WILCOX OF INDIA, LTD., boiler plant, coal handling plant, pipework, 40 ton turbine house crane. BRAITHWAITE BURN AND JESSOP CONSTRUCTION CO., LTD., Franki piling and foundation slab. BURN & CO., LTD., railway sidings, points and crossings. ENGLISH ELECTRIC CO., LTD., 400 V switchgear. FILTRATORS, LTD., water treatment, pumping and storage plant. FOSTER WHEELER, LTD., cooling tower. GENERAL ELECTRIC CO. OF INDIA, LTD., lighting installation. GWYNNES PUMPS, LTD., c.w. pumps and pumphouse equipment. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., cables. HINDUSTAN CONSTRUCTION CO., LTD., civil and building works, cooling tower foundations, riverside pumphouse cofferdam, "Gunniting" of bunkers, coal plant foundations. HINDUSTAN DEVELOPMENT CORPORATION, LTD., fencing and workshop doors. INDIAN GALVANIZING CO. (1926), LTD., metal windows, sashes and glazing. INDIAN IRON & STEEL CO., LTD., PORT ENGINEERING WORKS, LTD., and TATANAGAR FOUNDRY CO., LTD., various c.w. pipes. H. LALL & BROTHERS, laying and jointing c.w. pipes. A. REYROLLE & CO., LTD., 11 kV switchgear. RICHARDSON & CRUDDAS, LTD., building steelwork, fan rings for cooling towers. RUSTON & HORNSBY, LTD., diesel shunting locomotive. SELSON MACHINE TOOL CO., LTD., workshop equipment. UNITED STEEL COMPANIES (INDIA), LTD., piles and steel mesh fabric for bunker linings. YORKSHIRE ELECTRIC TRANSFORMER CO., LTD., transformers.

Many subsidiary items were supplied directly or to the principal contractors by Indian companies and indigenous sources were used wherever possible.

STREET LIGHTING SURVEY

INFORMATION on street lighting practice is given in a summary of replies to a questionnaire published by the Institution of Municipal Engineers. The survey covers 345 county boroughs, boroughs, metropolitan boroughs and urban district councils in England, Scotland and Wales. Their populations range from 1,871 to 1,112,000, with an aggregate of 22·3 million.

Of the total road mileage of 28,742 it is shown that 37·6 per cent is lighted by gas and 52·67 by electricity, while 9·73 per cent is unlighted. The average number of lamps per mile of lighted roads is 31·83 gas and 34·61 electric, representing average spacings of 166ft and 152ft.

Analysing the existing lighting installations of 343 authorities, the survey shows that 39·69 per cent of the lamps are gas, 49·78 per cent tungsten filament, 6·67 per cent mercury discharge, 3·37 per cent sodium discharge and 0·49 per cent fluorescent.

With regard to future installations, 214 authorities have indicated the type of lighting likely to be adopted. For the Group A standard none of the authorities proposes to use gas. Of the various types of electric lighting the preference is as follows (percentage of the total number of authorities):—Sodium, 34·1; mercury, 31·8; tungsten filament, 9·8; and combination of electric types, 18·7. For Group B lighting the percentages of authorities proposing to use the different forms of illumination are: Gas, 2·3; tungsten filament, 53·8; sodium, 14·6; mercury, 11·9; fluorescent, 1·4; and a combination of electric types, 16·0.

Most of the 345 authorities (94·5 per cent) have now designed their street lighting installations in accordance with the Ministry of Transport Departmental Committee's Report, 1937, or the Code of Practice (Traffic Routes), 1952, where the latter is applicable.

Only a small number use overhead electrical distribution to street lighting columns. The majority take the supply to individual lamps by a service from the main feeder cable and use individual time switches of the solar dial type. A considerable number, however, employ a separate street lighting core in the main feeder cable and lamps are controlled by a master time switch at a substation or other convenient point. Approximately 9 per cent have equipped their installations with ripple or d.c. bias control.

The Reliability of Earth Leakage Trips

Reasons for Failure of Early Equipment

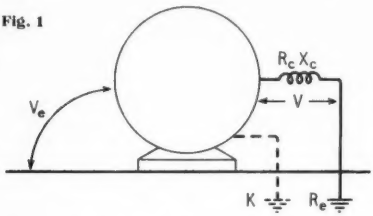
By T. C. GILBERT, M.I.E.E.

VARIOUS papers and articles have recently stressed the opinion that voltage-operated earth leakage trips are by no means absolutely reliable for the isolation of defective circuits and equipment, while cases of failure have been cited in evidence. Although the authors were in most cases advocating some alternative form of leakage protection, it has to be admitted that early devices produced in this country did exhibit unreliable characteristics and it is true that some types of leakage trip were prone to failure. In order to get the picture into proper focus, however, it is necessary to set out the several reasons for this apparent unreliability, and to show that with proper design and intelligent installation the modern standard earth leakage trip can be as reliable as any other form of mechanical device used for protective purposes to-day.

One of the main reasons for failure of early equipment is the fact that the first edition of the I.E.E. Regulations to recognize the leakage trip as an acceptable protective device, the tenth, was content to specify operation "with a current not exceeding 30 milliamperes," completely ignoring voltage of operation, the one important underlying principle of the method. This simple requirement converted the device into just another current-operated trip and makers of early equipment were obviously not concerned with voltages provided a good reliable break could be ensured with no more than 30 mA passing. In some cases this outlook led to essentially bad design, with long finely-wound trip coils; some early windings were of the order of 40 s.w.g. (one in the writer's possession has a coil wound with 44 s.w.g. and some failure of coil windings did occur. By virtue of its situation between exposed metalwork and earth the trip coil is exposed to risk of damage from induced secondaries from nearby lightning strokes, or even from part of the direct strike itself, and the high-reactance coils of the early trips were vulnerable. In some failed trips inspected by the writer the coils had fairly obviously been split apart by means of high-frequency discharges and it is assumed that they could only have been initiated by lightning; these examples were all in rural areas and in one or two cases were accompanied by similar damage to the voltage coils on the installation meters. This kind of trouble was also experienced by German engineers in the very early days of leakage trips and the first solution sought was to shunt the trip coil by means of a closely-set gap or a non-inductive resistance.

It was eventually found, however, that if the trip coils were constructed with comparatively low-reactance windings, necessitating heavier operating currents, then these additional measures were unnecessary and reasonable immunity from lightning damage could be secured. The

Fig. 1



$$V_e = V \sqrt{\frac{X_c^2 + (R_c + R_e)^2}{X_c^2 + R_c^2}}$$

importance of the impedance factor in the design of trip coils will be clear from Fig. 1, showing that operating voltage above earth, V_e, is more adversely affected by this than by high earth resistances. Even low-reactance trip coils cannot be expected to pass high-frequency lightning secondaries, however, and some attention to the end insulation of the windings, resulting in more effective mechanical anchoring of the end turns, is also necessary. The standard method of construction was modified to provide for careful interleaving of the winding layers and to terminate each layer at some distance from the coil cheeks; the space between the layer ends and the coil cheeks was then filled solid with a hard insulating material. This precaution appeared effectively to prevent damage to the trip coils, which in the past had resulted in all end windings being burnt away or split out in the form of a brush. British manufacturers now seem to have overcome any liability to lightning damage by means of very robust windings and the adoption of higher tripping currents —75 mA seems to be a common value, but even 100 mA will not introduce danger while ensuring even increased reliability.

That the high-reactance coils originally used are not necessary in order to limit voltages above earth on protected equipment to reasonable values is shown in Fig. 2, in which the characteristics of two trip coils are compared. The coil B, with X and R of 300 ohms respectively will trip with an electrode resistance of 500 ohms, assuming 15 V across the coil and no more than 30 V on metal casings. On the other hand, coil A, with both values 30 per cent less, will trip against an electrode resistance of 330 ohms, at the same coil and exposed voltages, and such resistances are not difficult to obtain. For instance, a 6ft spike driven into sandy soil (70,000 ohm/cm) would present a resistance of this order and it is probably the worst kind of earthing problem to be met in practice. Most modern standard trip coils have impedances of less than 200 ohms, at 50 c/s, and in one well-known range this has been reduced to 153 ohms in some capacities, while operation still remains within the voltage requirements of B.S. 842 against the specified electrode resistances.

Another cause of apparent failure of leakage trips in the past has been the rather reprehensible practice of using the trip as a sort of main switch for the installation, often necessitating its positioning in remote situations. In all leakage protective practice test and check are essential, lest it prove a snare and a delusion, non-existent when most wanted. The leakage trip is fitted with a test key in order to make a check of the mechanism and the earth connection, but unless it is pressed once in a while it might just as well not be there. This essential check, therefore, postulates the location of the leakage trip in an easily accessible position, with the test key used as the normal method of switching off. Without this check, leakage trip protection cannot represent any real advance upon haphazard direct earthing, and we are all well aware just how often that has let us down in the past; earth connections of leakage trips can fail just as easily as all others, and in one or two cases of failure investigated this was the responsible factor.

It has to be remembered that there is no automatic indication of the failure of main earth connections with any system of earth leakage protection, and the leakage trip is no exception; as a simple and ready means of check is provided, however, it is essential that the position of the trip be such that the test is made as automatic as possible, and usually the co-operation of the user is not difficult to ensure. It is hardly fair to charge the

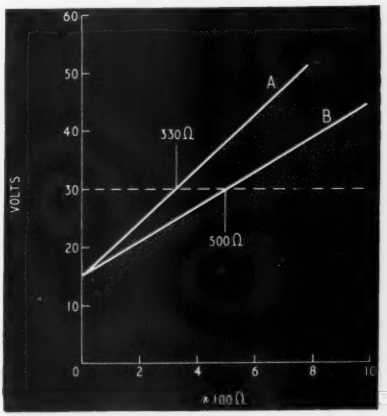


Fig. 2—Comparison of characteristics of trip coils

A. R_e = 200 ohms, X_c = 200 ohms, V = 15 volts
B. R_e = 300 ohms, X_c = 300 ohms, V = 15 volts

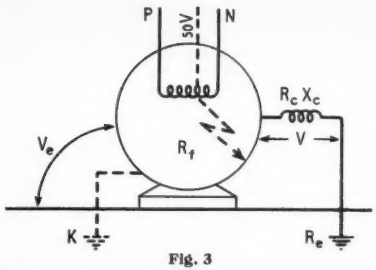


Fig. 3

leakage trip with failure when its earth connection is gone; the responsibility lies with the person responsible for putting it where the simple check was made difficult.

It has also been alleged that with modern leakage trips employing comparatively large operating currents, the incidence of high fault resistance coupled with high earthing resistance will prevent operation of the trip, with probably full mains voltage remaining unisolated upon the connected metal casings. A suggested cure for this is the installation of a parallel direct earth connection, shunting the trip earth, preferably made to a normal water pipe electrode assumed to provide a low-resistance earth connection. In the first place, the original assumption of non-operation is not correct, as will be seen from Fig. 3, in which a rather extreme value for fault resistance, R_f, is taken as 200 ohms; the assumed impedance of the trip coil is 200 ohms and the earth resistance, R_e, 100 ohms. The diagram shows an earth fault occurring at a point 50 V above the neutral end of the winding, and the current through the trip coil would be:

$$I = \frac{50}{200+200+100} = 100 \text{ mA}$$

This would normally be sufficient to operate the trip, but assuming again that the mechanism has become corroded due to bad positioning and lack of check, and that it has stuck, the voltage above earth remaining on the connected casings is:

$$V_e = \frac{100}{1{,}000} (200+100) = 30 \text{ V}$$

This is very far from being the full mains voltage, and it might be noted that with the provision of the designed parallel earth connection K, with a resistance of no more than 3 ohms (loop) no isolation will be effected, but in addition any chance of operation of the trip is rendered even more remote. The answer is, of course, to avoid all such parallel earths, as, even with no higher resistance than the 3 ohms suggested, with a healthy trip in parallel connection it would be necessary for the winding fault to burn down sufficiently to pass 10 A or so and result in a 30 V potential against the trip for isolation. This might not be possible and the 10 A would almost certainly not blow the circuit fuse.

In the case of Fig. 3, as with the other diagrams, it is assumed that the trip earth has been made to an independent electrode and not to the usual water pipe or cable sheath. This practice can often ensure considerable shortening of the earth conductor run, with some gain in reliability for this reason, and is, in fact, recommended in all cases of employment of leakage trips. If the trip earth is made in the orthodox direct earth manner there must always be some risk of short-circuiting the coil, or at least some reduction of dependence upon it, by reason of accidental contacts to water or gas pipes (with gas water heaters the two are metallically connected) and this even remote possibility should be avoided. Considerable gain in selectivity can be ensured with independent electrodes, and, for what it may be considered to be worth, this has been standard German practice from the introduction of leakage trips.

In conclusion, it can be stated with confidence that with modern trips, constructed in accordance with the operating conditions laid down in B.S. 842, and by experienced manufacturers, all the disabilities of the early types have been overcome. They may be installed with every certainty of operation, always provided that they get an occasional, preferably a periodical, test. Manufacturers will confirm that returns for fault have now reached a negligible level, and whatever the shortcomings alleged against the early types these no longer prevail.

National Certificates

THE Ministry of Education has issued Rules 127 setting out the arrangements and conditions for the award of National Certificates and Diplomas in Electrical Engineering. These have been revised in consultation with the Institution of Electrical Engineers and come into operation at the beginning of the educational year 1953–54. Copies (4d net) can be obtained from H.M. Stationery Office.

Economics of Water Heating

Immersion Heaters in Post-War Housing Estates

INVESTIGATIONS by the Building Research Station[1] have shown that in local authority houses it is uneconomic to use solid fuel for water heating in the summer. This leaves the alternative of either an electric immersion heater or a gas circulator to be fitted to the hot-water cylinder of the solid-fuel installation, now generally of the fireback-boiler type. From the points of view of national coal economy and running cost to the consumer, no decisive difference exists between these alternatives. However, the electric immersion heater has been accused of aggravating the (now receding) peak-load problem of the supply industry, and was therefore for some years subjected to a discriminatory and prohibitive purchase tax of 100 per cent. Although the situation is now better the rate is still 75 per cent.

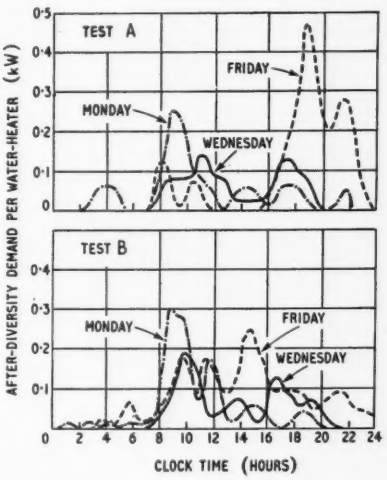
To obtain factual information about the electricity supply aspect of the provision of immersion heaters in post-war housing estates, two large-scale tests have been carried out under the ægis of the Utilization Research Committee of the B.E.A. and Area Boards, and some results are given below.

For the first test, "A," a sample of 50 consumers was selected from two large Council estates in the London area, the two estates covering a total of 3,600 dwellings, each having a backboiler and electric immersion heater. The other test, "B," was based on a similar sample, drawn from the 800 tenants of a Corporation estate at Manchester, the immersion heaters being of the circulator type. In the water-heater circuits of the consumers selected, operation recorders[2] were installed for a fortnight in the winter and another fortnight in the summer, and concurrent records obtained. The annual kWh consumption was measured by means of sub-meters, and surveys of the composition of households, appliances installed, etc., contributed the necessary background data.

In both cases the heater elements had a rating of 2 kW, but the cylinder capacity was 30 gal in test A and 20 gal in test B. All consumers had washboilers (either electric or gas) and the average size of household was 4·1 and 4·4, respectively.

By summing for each half-hour the individual load records obtained and dividing by the number of consumers involved, after-diversity-demand (a.d.d.) curves have been evolved, as shown in Fig. 1, for three characteristic working days in the winter. The lowness of the demands proves that only a small proportion of the consumers make any use of the electric heater during the cold season. During potentially peak periods, the a.d.d. substantially exceeds 0·1 kW/consumer only on Monday, owing to clothes washing. The Friday evening peak with sample A,

Fig. 1.—Water heater a.d.d. curves: winter working days



[1] "Domestic Water Heating," by J. C. Weston. Journal I.H.Vent.E., 1950. Vol. 17, p. 517.

[2] These instruments record only the "on" and "off" periods, which is sufficient for a circuit supplying a fixed load. They are much simpler than recording ammeters or wattmeters.

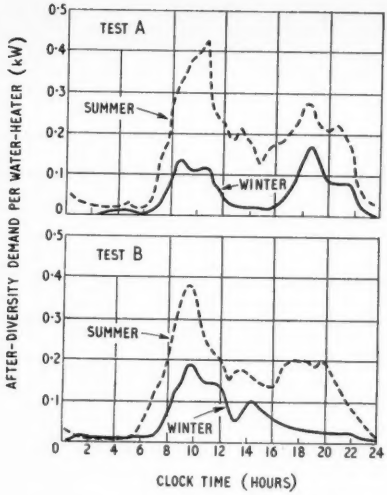
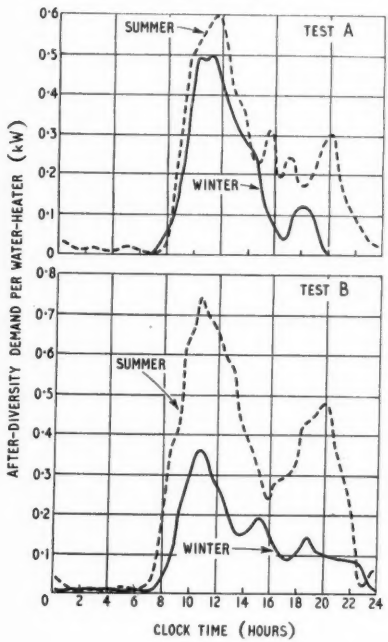


Fig. 2.—Water heater a.d.d. curves: average of five working days, winter and summer

Fig. 3.—Water heater a.d.d. curves: Sunday, winter and summer



caused by hot water used for bath purposes, occurs essentially when the system peak has subsided.

The general characteristics of the week-day load are more clearly discernible in Fig. 2, which shows the average of five consecutive working days for both winter and summer. By this averaging process, the effect of systematic variations between days (as distinct from random fluctuations, which tend to cancel out) is reduced to one-fifth, and as system peak demands may occur on any of the five working days of a week—depending mainly on weather conditions—these curves form a suitable basis for the assessment of the economics of the type of load in question, with a certain margin to allow for the probability of somewhat higher demands if the system m.d. happens to occur on a Monday morning. At 8 to 9 a.m. in winter, when the national system load is apt to form a major peak, the a.d.d. is of the order of 0·1 kW/water heater, whereas at around 5 p.m., when the annual system m.d. is now likely to occur, the figure drops to nearly half this value. On the other hand, the graph illustrates the much higher demands in the summer, which is an "off-peak" period.

Finally, Fig. 3 shows comparative Sunday curves and indicates that the demand (and consumption) is a great deal larger than on working days—again a very welcome feature.

The favourable seasonal variation of the consumption was confirmed by the monthly meter readings, which showed that the average consumption per heater in a summer month was about twice that in a winter month.

Supply Economics

To assess the value of the load from the supply point of view, it is necessary to relate demand to consumption, the conventional index being the annual load factor. Samples A and B had average annual consumptions of 1,020 and 930 kWh/consumer, respectively, and with the a.d.d. figures referred to above, the "effective" annual load factors for the times of the national peaks work out at about 100 per cent for the morning and well above this value for the late afternoon.

Consequently, there can be no doubt that in relation to the national generating system this type of load is most economic

to supply. Owing to the higher Sunday demands, which practically coincide with the cooking peak, the load factor in respect of residential distribution systems with substantial cooker-saturation factors is lower—between 30 per cent and 45 per cent—but as the demand-related portion of the costs of such systems represents only a fraction of their total costs the economic significance of load factor is much reduced.

As the housing estates investigated are typical of many others it appears admissible to conclude that the provision of electric immersion heaters in conjunction with solid-fuel installations is advantageous to both tenants and supply authorities, and should be encouraged in every possible way. However, in order to ensure satisfaction to the consumer and to avoid waste of national fuel resources, it is essential that the water-heating installations be carried out in accordance with British Standard Code of Practice CP 324202: "Domestic Electric Water-Heating Installations." The following main points cannot be repeated too often: (*a*) positioning of the hot-water cylinder as near as possible to the most-frequently used tap, (*b*) efficient lagging of the whole cylinder, and (*c*) correct layout of piping to prevent circulation losses in vent pipes and reverse circulation through the boiler.

PARLIAMENTARY NEWS

By Our Special Reporter

IN the House of Commons last week Mr. Cledwyn Hughes asked the Minister of Agriculture what percentage of the farms in each of the North Wales districts of the Merseyside and North Wales Electricity Area were supplied with electricity.

Sir Thomas Dugdale said he regretted that the information was not available as the Sub-Areas were not confined to North Wales. He was informed by the Board that on 31st March last 4,963 holdings in North Wales were connected out of a total of 25,248. That was nearly 20 per cent.

Rural Electrification

Mr. Nabarro last Friday attempted to raise the question of capital investment in rural electrification, but he was handicapped by the fact that a full day's debate was expected on 19th June. He was, however, supported by Mr. Harold Davies and some comparison was made with the progress of rural electrification in the United States and France.

Mr. Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power, assured Mr. Nabarro that if he would wait for a week he would get full satisfaction from the Minister himself, who would be able to deal with Government policy in marginal cases of rural electrification. With regard to progress in this country compared with America and France, to make such comparisons would be odious and, indeed, dangerous. He did not believe that the American definition of a farm was at all the same as ours. We considered a farm as practically any unit of agricultural production, and we included in that practically any holding.

It was perfectly true that France had a very high rate of electrification, but a very large proportion of this electrification was for lighting only, and a very large proportion was carried out on a low voltage system and the supply was not of a quality which could be envisaged in this country at all. It was a system likely to land the French into considerable trouble and no person in this country would desire that we should prejudice the development of electricity here by adopting French methods.

With regard to the allocation of capital investment for rural electrification, he would point out that the onus for decisions on rural electrification lay on the Area Boards and they made up their minds how much they wanted to spend. When they had arrived at the total they submitted the figures to the B.E.A., which went into all the aspects, practical and otherwise, and, as a result, the B.E.A. agreed on a figure for the whole industry. That figure was then submitted to the Government whose responsibility it was to decide on capital investment for the country as a whole. The Government then decided how much of the capital investment of the country should be allocated to the electricity supply industry, and that decision was passed to B.E.A. It might be that the application of the B.E.A. had been cut down; then the Authority and the Boards had to decide who was going to bear the cuts. Having decided that, the total sum allocated was then distributed between the Boards, and it was for them to decide how to spend it.

In 1951 the previous Government came to the conclusion that a drastic reduction in the amount of capital investment must be imposed. In the electricity supply industry it was decided that there must be a reduction of £2 million, and it was considered that the simplest way to do so was by postponing rural development.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Minister of Transport has appointed **Mr. R. A. Lovell**, O.B.E., M.I.Mech.E., to succeed the late Mr. A. E. N. Taylor, B.Sc.(Eng.), A.M.I.C.E., as deputy chief engineer, electrical and mechanical. Mr. Lovell joined the Ministry of Transport in 1931. He has served on the headquarters staff throughout his career and since 1946 has held a senior post in the Electrical and Mechanical Engineering Branch.

The North Western Division of the British Electricity Authority has announced the appointments of deputy superintendents at a number of power stations in the Division.

Mr. T. W. Maughan

Mr. T. W. Maughan, M.Inst.F., has been appointed deputy station superintendent at Stuart Street, where he formerly held the position of boiler house superintendent. He served his apprenticeship with Laurence, Scott & Electromotors, Ltd., Manchester, and studied at the Manchester College of Technology. He commenced his career in the electricity supply industry in 1930 as junior engineer at his present station. After a short period at Barton as control engineer he returned to Stuart Street as boiler house technical assistant. In 1943 he became senior control engineer at Barton and was appointed boiler house superintendent at Stuart Street in 1948.

Mr. T. H. Exelby, A.M.Inst.F., former charge engineer at Ribble generating station, succeeds Mr. A. Beckett as deputy superintendent and took over his new duties on 1st June.

Mr. A. M. Whyte, A.M.I.Mech.E., former deputy superintendent at Walsall generating station, has been appointed deputy superintendent at Roosecote (Barrow) station, as from 1st July.

Mr. A. Ball has been appointed deputy station superintendent at Wigan (Bradford Place). He was previously shift charge engineer at this station.

Mr. J. C. Hodkinson, A.M.I.E.E., A.M.C.T., has been appointed deputy power station superintendent at Carrington. Since April, 1951, Mr. Hodkinson has held a similar position at the new Westwood (Wigan) power station. From 1936 to 1951 he served at North Wilford power station.

Mr. H. Gill, resident engineer, North Wales Group office, Mersey and North Wales Division, B.E.A., retired on 31st May. Mr. Gill commenced his career in 1899 with Yates & Thom, Blackburn, and was subsequently with Dick Kerr & Co., the British Aluminium Co., and the British Thomson-Houston Co., Ltd., before joining the North Wales Power Co. in 1922, transferring to the Mersey and North Wales Division on vesting date.

Mr. D. N. Dow, B.Com., C.A., A.C.W.A., until recently personal assistant to Mr. Ian T. Morrow, C.A., F.C.W.A., deputy managing director of the Brush Electrical Engineering Co., Ltd., has been appointed secretary to the National Gas & Oil Engine Co., Ltd. **Mr. Harold S. Colls**, A.C.A., until recently secretary to the National Gas & Oil Engine Co., becomes chief internal auditor to the Group, and **Mr. R. H. Irwin**, A.C.A., lately attached to the accountancy staff of the Brush Electrical Engineering Co., Ltd., becomes an assistant to Mr. Colls.

Mr. A. R. Driessen, O.B.E., commercial manager of the Indian Cable Co., Ltd., has been appointed chairman and managing director, with effect from 1st May, in succession to **Mr. D. J. McIntosh** who has retired. Before being appointed commercial manager in August last year, Mr. Driessen was eastern area branch manager in the United Kingdom for British Insulated Callender's Cables, Ltd. He joined the former British Insulated Cables, Ltd., as manager of the sub-office at Ipswich in 1944.

The Minister of Fuel and Power has appointed **Sir Geoffrey Summers**, Bt., C.B.E., of Dyserth, Flintshire, to be a part-time member of the Merseyside and North Wales Electricity Board, and **Lord Braintree** to be a part-time member of the Eastern Electricity Board.

B.V.C. Industrial Constructions, Ltd., has appointed **Mr. W. Bulloch**, Assoc.Eng., A.M.I.Mech.E., to control all activities of its Hydraulic and Mechanical Materials

Handling Department. For nearly twenty-five years Mr. Bulloch has been actively associated with the development of hydraulic and pneumatic ash and dust handling plants and since joining the company he has been employed in the development of the B.V.C. hydraulic ash handling plant.

In the list of electrical men whose names appeared in the Coronation Honours, published in our last week's issue, we mentioned **Mr. T. C. Hunter,** distribution engineer, Fife Sub-Area, South East Scotland Electricity Board, who was awarded the M.B.E. We now reproduce Mr. Hunter's portrait.

Mr. T. C. Hunter

Captain R. T. Paul, C.B.E., R.N. (retired), A.M.I.E.E., commercial manager of the Equipment Division of Mullard, Ltd., has been appointed a director of Telcon Telecommunications, Ltd., by Mullard, Ltd., in place of **Dr. D. B. Foster,** who has resigned from the board owing to pressure of work in other directions.

Mr. Leslie Gamage, vice-chairman and joint managing director of the General Electric Co., Ltd., has been re-elected president of the Institute of Export for the eleventh time in succession.

Mr. F. Curt Smith, founder and chairman of the Visco Engineering Co., Ltd., Croydon, has retired from active participation in the business after thirty-two years with the company. **Col. G. Mallett,** M.C., T.D., has succeeded him as chairman, and **Mr. Fred C. Smith** will continue as managing director.

Mr. Arthur Shaw has joined Dimplex, Ltd., to handle advertising and sales promotion. Mr. Shaw was previously on the advertisement staff of *Picture Post*.

Mr. R. J. Bellis, Graduate I.E.E., has been appointed first assistant engineer in the Gainsborough District of the Yorkshire Electricity Board. Mr. Bellis was previously engaged as assistant section engineer at Oswestry. On behalf of the staff in the District and his former associates at Legacy, Mr. F. O. Harber, district engineer, presented Mr. Bellis with a gold wristlet watch suitably engraved.

On 6th June the **Ferranti Foremen's Association** held its annual general meeting at the Ferranti Edinburgh factory. Accompanied by Mr. W. Hunt, general works manager of Ferranti, Ltd., the members of the Association from the Hollinwod and Moston Works travelled by air in two thirty-two seater Dakota planes chartered specially for the purpose. On arrival at Turnhouse Airport, they were met and conveyed to the Edinburgh Works for a tour of inspection. After lunch, the general meeting was held and then arrangements were made for coaches to convey the party on a tour of the city, including a visit to Edinburgh Castle and the Forth Bridge. After high tea, the evening was spent at a smoking concert before returning by plane to Manchester.

Mr. M. H. Alder, B.Sc.(Eng.), of Standard Telephones & Cables, Ltd., has been elected chairman of the London Students' Section of the Institution of Electrical Engineers for the 1953-54 session.

Mr. P. T. Bliss has been appointed sales director of G. A. Harvey & Co. (London), Ltd. Mr. Bliss, who is a member of the Incorporated Sales Managers' Association and the Incorporated Advertising Managers' Association, joined the company in 1909, and has been sales manager for a number of years.

The inter-company sports meeting of the **British Driver-Harris Co., Ltd.,** Manchester, and **Ripaults, Ltd.,** Enfield, was held on 6th June at Enfield, the hosts winning the Parry-Roberts trophy for the third time running. The managing director of British Driver-Harris, Mr. R. M. Parry, presented the trophy to the victors and thanked Mr. G. A. Roberts, managing director of Ripaults, and his company for an enjoyable meeting for more than 1,000 employees.

The **London Electric Wire Co. & Smiths, Ltd.,** held a Coronation dance on 5th June, when 900 employees and friends attended the celebrations held at the Walthamstow Assembly Hall which, together with adjacent buildings in the Civic Centre, was attractively floodlit. The evening's festivities, arranged and presented by the Lewcos Welfare Council under the guidance of the committee chairman, Mr. C. W. Kelsey, included a cabaret. A welcome to Leyton employees and their friends and relations was extended by Mr. S. B. Klein, general manager of the company.

The **Telegraph Construction & Maintenance Co., Ltd.,** organized several functions to celebrate the Coronation. On 30th May over 900 employees attended a supper and cabaret given by the company at their Sports Ground at Kidbrooke, and every employee received a suitably inscribed tea-caddy spoon as a memento of the Coronation. On 3rd June a Coronation luncheon was held at Claridges which was attended by 130 friends and associates of the company in the cables, metals and plastics industries. Lord Colgrain, chairman of Telcon, presided and the principal speaker was Sir Hamish D. MacLaren, K.B.E., C.B., D.F.C., Director of Electrical Engineering, Admiralty. On 29th May, **Submarine Cables, Ltd.,** owned jointly by Siemens and

Telcon, held a Coronation dinner and cabaret at Claridges. The guests, many of whom came from overseas, included representatives of the cable operating companies and the Post Office. Mr. J. N. Dean, chairman and managing director of Submarine Cables, Ltd., presided, and Mr. Bent Suenson, vice-chairman and managing director of the Great Northern Telegraph Co., Ltd., of Denmark, proposed the toast to the company. General Sir William D. Morgan, G.C.B., D.S.O., M.C., chairman of Siemens, proposed the health of the guests and Mr. K. Bruce Mitchell, director of international communications, the Western Union Telegraph Co., New York, replied. Friends and associates of Telcon from overseas were entertained on the processional route and throughout Coronation week.

The weather was dull for the annual sports meeting of the **Eastern Electricity Board's Northmet Sub-Area** at Woodcroft, Winchmore Hill, last Saturday, but in spite of the soft going a new record of 4 min 59 sec was established by G. Holmes of Brimsdown in beating the previous holder for the mile championship. Miss J. Plater retained the ladies' 80 yd title and also won two jumping events. In the men's 100 yd championship P. Walton failed to win his heat and the title passed to J. Marshall. The relay races were divided between Northmet House and the Outside Department. A crowd of the staff with their families and friends enjoyed sideshows as well as the athletics. There were children's sports, balloon races, a Punch and Judy show and a model railway.

Towards the end of last year the **South West Scotland Electricity Board** agreed to proceed with the appointment of district commercial engineers and applications were invited for the appointments, within Grade 3 of the National Joint Board Agreement. Appointments have been made to thirteen districts and the vacancies in the seven districts of Lanarkshire Sub-Area, in the Eastern District, Glasgow Sub-Area and the combined Paisley/Johnstone District, Clyde Sub-Area, are being re-advertised.

The **Hoover (Perivale) Football Club** won the six-a-side competition sponsored by the Wembley Borough Council in connection with its Coronation festivities. The competition was held on 6th June and thirty-five clubs entered teams.

Sir John Hacking introducing Mr. J. R. Beard, the new president, at the British Electrical Power Convention, Torquay

OBITUARY

Mr. Henry Arthur Campbell, M.I.E.E., who was for twenty-four years chief electrical engineer of the Jamaica Public Service Co., Ltd., died on 6th June at Kingston, Jamaica, British West Indies.

WILLS

Mr. W. A. Wilson, A.M.I.E.E., retired electrical engineer, who died on 27th February last, left £30,268 gross (£30,116 net). He left £500 to the Benevolent Fund of the Institution of Electrical Engineers.

Mr. M. F. Frankenburg, chairman of the Greengate & Irwell Rubber Co., Ltd., who died on 11th February last, left £109,065 gross (£106,766 net).

Mr. Andrew Gray, radio pioneer and personal friend and assistant of Marconi, who died on 22nd March last, left £3,029 gross (£1,930 net).

Mr. G. F. Bellwood, retired G.P.O. electrical engineer, who died on 25rd March last, left £6,057 gross (£5,947 net).

Mr. H. G. Leivesley, M.I.Mar.E., A.M.I.E.E., late of the Metropolitan-Vickers Electrical Co., Ltd., who died on 14th February last, left £7,352 gross (£7,057 net).

Mr. J. A. Osler, chairman of F. & C. Osler, Ltd., Birmingham, and Osler & Faraday, Ltd., who died on 3rd February last, left £76,340 gross (£75,925 net).

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 10th July:—

No. 714,420 (design), Class 9. Alternating current electric rectifiers; photo-electric cells; electrical apparatus for regulating current and voltage; mechanical and luminous signs; railway signals; illuminated indicating panels; and electrical control apparatus included in Class 9 for use therewith.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London N.1.

ARRELL. No. 715,358, Class 9. Electrical instruments and apparatus included in Class 9; and television aerials and parts and fittings included in Class 9 for such goods.—R. Lowther, Ltd., 100a, St. Vincent Street, Ancoats, Manchester, 4.

No. B712,380 (design), Class 11. Electric torches.—Union Carbide & Carbon Corporation, New York, U.S.A. Address for service, c/o Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

"Those Early Stations"

THE article you published from Mr. W. E. Warrilow, M.I.E.E., under the above heading was very timely and most interesting.

Off the shelves of a second-hand bookshop I got a copy recently of "The History of the Electric Light Industry" by R. H. Parsons, illustrated with engravings and early photographs and full of anecdotes and engaging "slants" on those early days. It is one of the most fascinating books to read if, like Mr. Warrilow, you find the past endeavours and struggles of the industry (both technically and legally speaking) just as enthrailing as speculation about breeder-reactors, and U. 235.

I still maintain that the gentle "woofing" pulsations of a Willans or a Belliss, an Allen or a Sissons engine is the sweetest music in the world, and for sheer sex-appeal in the engine room the flashing limbs of a high-speed vertical, close-coupled to its generator—gleaming copper and sparkling brushgear: what a splendid sight!

I will conclude these reactionary and nostalgic remarks by offering to lend my book aforementioned to Mr. Warrilow (should he not have seen it) or any other likely to come under the same spell of fascination in reading of those early days.

Egham, Surrey. JOHN W. A. MANN.

Power Station Statistics

YOUR issue of 5th June contains some errors about the stations in this Division.

On page 1295 particulars of Ferrybridge are wrong. No extensions are in hand; a new station known as Ferrybridge "B" is being built. It will contain three 100 MW reheat units, 1,500 lb/sq in, 975 deg F with 950 deg F reheat.

Wakefield similarly is a new station of four 60 MW 900/900 units, not far from the old station. This station has been under construction for a year already.

As regards performance: on page 1286 the "honours list" of new stations might well mention Skelton Grange, 29·19 per cent, which we believe is the top figure for 900 lb/sq in plants.

Leeds. A. J. HODGKINSON,
for W. H. DUNKLEY,
Chief Generation Engineer (Construction),
Yorkshire Division, B.E.A.

Industrial Electricity Supplies

WITH reference to the paper on "Electricity Supplies for Industry" given by Messrs. Johnson and Holder at the recent Power Conference, it is refreshing to find an official of an Area Board taking so realistic a view of the basis on which an industrial tariff should be designed.

Unfortunately one very important point is omitted: Area Boards do not recover the whole of their fixed costs by the demand charge alone as is suggested in the paper. No small part of these costs is recovered by means of a hidden element in the "unit" charge. The reasons for this are well-known but what has been overlooked in all industrial tariffs published so far is that unless the whole of this hidden element is removed from the unit charge at a load factor corresponding to one-shift operation (say about 25 per cent) the high-load-factor consumers, and particularly the continuous process industries, are penalized.

A two-part tariff consequently does not automatically take care of load factor. There must, in addition, be a substantial drop in the unit charge at about this load factor. The reason for this is quite clear if we consider two ordinary industrial consumers "A" and "B" each working one shift. The tariff is designed so that each of these consumers on the average pays his correct proportion of the Board's fixed charges. If "B" now decides to increase his output by working three shifts

without increasing his maximum demand it is obvious that as his first shift has paid his proper proportion of fixed charges the hidden element must be removed from the unit charge for shifts two and three unless he is to pay more than his fair share of the Board's fixed costs.

*London, S.W.*1. G. RHEAM,
Chief Engineer,
Associated Portland Cement Manufacturers, Ltd.

Generator Excitation

I HAVE just read with interest the short article entitled " Generator Excitation " in your issue of 15th May (p. 1119). It seems to me that the explanation of the method of operation of the regulating circuit is in need of revision, for while it may convey the general idea it does depart from good practice in the references to Fig. 2 which state, among other things, that " d is the voltage vector, f_1 the current vector. . . ." These vectors then are added to obtain a resultant voltage vector. The references to " the component of the current transformer " and " the component of the voltage transformer " are also vague.

I am not acquainted in more detail than that available in the article with the physical nature of the transformers involved, but it would seem that the current transformer is not the ordinary type of instrument transformer. The presence of the adjustable air gap indicates a relatively large magnetizing component of primary current. With this assumption a reasonable qualitative explanation follows if all the vectors in Fig. 2 of the article are considered to be voltage vectors. It is only necessary then to establish that the " current " transformer produces a secondary voltage proportional to and 90 electrical degrees ahead of the line current. This condition will occur if the magnetizing component of primary current is large compared with the reflected value of the current flowing in the secondary circuit. The vectors e_1, e_2 and e_3 would represent the voltages applied to field and rectifier, and the field currents would be proportional of course to the magnitudes of these vectors. Presumably the regulator should function as well for leading as for lagging power factors.

There is one small error in Fig. 1 where two of the primary leads are shown connected to line A whereas in fact one of them should be connected to line C.

Kingston, Ont. C. H. R. CAMPLING,
Dept. of Electrical Engineering,
Royal Military College of Canada.

Engineering in Europe

Survey of Current Literature

THE commutation process in a.c. machinery is a complex phenomenon and cannot with any reliability be studied on the machines while in operation. The difficulties are partly due to the fact that it is quite impossible to separate the basic phenomena of the commutation process from accidental factors of an electromagnetic and/or mechanical character.

The author's model tests were carried out in a set-up driven by a synchronous motor at 1,500 r.p.m., so that the commutation process could be synchronized with the current process in the system. Also, the commutator investigated stood still while the brush system, consisting of two brushes each covering two commutator segments, rotated. The brushes were carefully ground and the collector-brush contact resistance was the only contact resistance occurring in the circuit. The commutator could be adjusted in any position desired so as to vary the instant of commutation with respect to the phase of the current. The armature winding was also stationary and could easily be replaced by other types of winding for studying the effects of its self-inductance on the commutation curve. The equation of the commutating current, although derived for the model used, was not found to be correct as it could not represent the oscillograms taken.

Generally, the process cannot be regarded

as a single process at all, but only as two quite distinct processes, i.e., that of making and breaking of the circuit of the segment under the brush (this had been proved previously by M. F. Karasev for d.c. machines). The inductance of the armature branch under commutation has a considerable influence on the curve form of the commutating currents.—" Modelling of the Commutation Process in Single-Phase A.C. Collector Motors," Yu. E. Nebolyubov, *Elektrichestvo*, No. 3, pp. 39–43, 1953, in Russian.

Balancing Rotating Machinery

There are four different types of electric vibration meters in use nowadays which enable a wide variety of purposes and special conditions to be satisfied. The first type, using what is known as an electrodynamical transducer, is based on the principle of a " plunger coil " moving in a static magnetic field. Its theory uses the differential equation of a " seismic system " and shows that the sensitivity of the instrument depends strongly on the natural frequency of the system. In the second, or electromagnetic type, the transducer contains no moving parts but only a stationary permanent magnet and coil and is used either on ferromagnetic objects, or with a ferromagnetic disc fixed to the object. The vibrations of the object are reflected in alternating variations of the flux density in the magnet inducing an alternating e.m.f. in the coil.

Drawbacks of this apparatus are its considerable distortions and, at higher frequencies, eddy current disturbances. More elaborate are the types of instrument with carrier-frequency supply, of which the two main variants are that with variable couplings and that with variable resistances. The first of these is essentially a mutual-inductance bridge, whereas the second is a resistance bridge two of whose arms are leaf springs whose resistance is periodically varied by bending, since they support a vibrating mass.

The measuring and recording apparatus combined with the above transducer types invariably contains a c.r.o. which is no mere convenience in this case, but an intrinsic component of any such instrument, since it provides the reference and calibrating voltages without which measurements would be impossible. The actual use of these instruments for balancing machine rotors by the dynamical method requires the additional use of a so-called phase indicator which makes it possible to determine the value and direction of the unbalance of two measurements. The balancing vector diagram may be based on travels, speed or acceleration vectors measured.—" Vibration Measurements and their Use for Balancing Rotating Machinery," D. Dam, *A.S.E. Bulletin*, Vol. 44, No. 1, pp. 4–11, 10th January, 1953, in German.

System Short-Circuit Calculations

In long-distance transmission systems the special arrangement for longitudinal voltage regulation under load usually comprises a regulating and a booster transformer in cascade connection; the primary winding of the regulating auto-transformer is delta-connected and supplied from the l.v. busbars of the substation while the secondary winding is provided with tap-changing gear for regulating the voltage applied to the Y-connected primary winding of the booster transformer. The secondary winding of the latter, also Y-connected, is in series with the h.v. winding of the main transformer at its neutral terminals. Other variants of this arrangement are also used in which the regulating transformer is directly supplied from the regulated system and the secondary winding of the booster inserted in a gap of the line, or between the line-side terminals of the main transformer.

The method of calculating the short circuit currents explained is based on the superposition of load and fault currents. This is a simplification because it makes the introduction of the positive-sequence e.m.f.'s of the individual generators, which usually differ, unnecessary. The equivalent circuits given for cases of internal and external short-circuits may be conveniently treated by quadripole-theory. All the possible faults are treated in full detail by the author in several variants of equivalent circuits and several numerical examples are given.—" Calculation of Short Circuit Currents in Power Systems with Longitudinal Voltage Regulation under Load," A. B. Chernin, *Elektrichestvo*, No. 2, pp. 13–24, 1953, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

VIEWS on the NEWS

By REFLECTOR

AT this year's show of the Iris Society Mr. H. J. Randall, chairman of the London Electricity Board, again did well. He not only secured three awards in various classes but also the Josephine Romney Towndrow trophy for the iris of the year of the most perfect form. This flower was raised in America and shown by Mr. Randall and is described by *The Times* as "a bicoloured iris of delicate pale yellow and light lavender shading." I also see that Mr. H. Senior Fothergill, who is secretary of the Electrical Industries Benevolent Fund, succeeded in winning the Insole Cup.

* * *

In reviewing a comprehensive directory of German export firms the *Manchester Guardian* says that "British exporters are not nearly so well catered for as their German rivals." It considers that the nearest examples are the directories issued by the British Chemical Plant Manufacturers and the British Electrical and Allied Manufacturers' Association. But this is comparing rather different things. The German directory is far too comprehensive in its scope to be useful as a guide in the selection of equipment; as a correspondent says, it covers "everything from textiles to tintacks." On the other hand the B.E.A.M.A. Catalogue, although its scope is wide enough to take in most electrical manufacturers, contains sufficient illustrated detail of plant and appliances to indicate which manufacturers can supply the items particularly needed.

* * *

I have referred in the past to the practice of some people in rural areas of declining a supply of electricity when lines are being provided in their districts because of the necessity for making a capital contribution. Then when the supply has got going they have asked for connection and hope to avoid their share of the initial cost. It is pleasing to see that some of the Electricity Boards are scotching this practice. In the South Western Area, for instance, the farmers are encouraged to form groups to undertake responsibility for the line rental charged by the Board. They apportion this expense among themselves and are in a position to put pressure upon any who seek to take advantage of their fellows.

* * *

Sir John Hacking's references in his presidential address at Torquay to the eventual use of heat from nuclear fission raise a train of reflections upon the results on power station practice. Most thought concentrates upon the point of firing in the boiler house but the substitution would bring about a revolution in the preliminaries and the aftermath. Coal is a troublesome material. It occupies too much of the railway system's time (although the system lives on the revenue), it necessitates elaborate and expensive handling plant at the power station, it takes up a lot of room and it is generally pulverized for blowing into the furnaces. While it is burning draught fans have to be kept going and the grit and fumes have to be restrained from going, involving the provision of precipitation and grit catching plant. When all the coal is burned the disposal of the residue has to be faced and a further sequence of operations is set up. The final result is the covering of acres of land, which could be better used, with ash and clinker. Nuclear energy would certainly save a great deal of trouble although, of course, it would introduce its own particular problems.

* * *

At a meeting of the Southport Highways and Works Committee reference was made to a 50 per cent increase made by the Merseyside and North Wales Electricity Board in the charge for the lighting of traffic signals. The Committee's chairman is stated to have described this as "highway robbery"—possibly *le mot juste*.

Power Convention

Final Report of Proceedings

FAVOURED by a continuance of fine weather the fifth British Electrical Power Convention held at Torquay proved to be probably the most successful of the series. Continuing our report from last week, we give below accounts of the speeches at the remainder of the functions.

Annual Dinner

Sir John Hacking presided at the annual dinner which was held at the Imperial Hotel on 11th June, when the guest of honour was Sir Archibald Forbes, immediate past president of the Federation of British Industries.

Proposing the toast of "The Electrical Industry," Sir Archibald Forbes said it was most appropriate that, at a time when an increase in the volume and in the efficiency of industrial production was vital to the prosperity, and indeed to the solvency, of the country, the Convention should have been discussing the place of electricity in the national economy. A freely available supply of electricity at a reasonable cost was essential to industrial development. The industry was to be congratulated on the manner in which it had faced and overcome the plant shortage difficulties.

Glad though everyone would be to see bigger and better power stations, there had to be some re-equipment in general industry from our limited resources. He need not go further to illustrate that than the manufacturing side of the electrical industry itself, which not only played an essential part in the whole of our industrial and social life but was in the forefront of the export drive. The country owed much to the skill, the courage and the determination of the manufacturing side of the electrical industry and particularly the way in which it had been able to meet competitors, and even indigenous competitors, in a country which prided itself on the efficiency of its electrical industry.

Sir John Hacking, whose name he coupled with the toast, had had a most distinguished career. The electricity industry, and indeed the whole country, were extremely fortunate that a man of his distinction should be prepared to devote his talents to the carrying on of one of our most vital national services.

The President, in his response, said that in regard to the plant position while they could take great pride in what had been achieved in the last few years, they were not out of the wood yet, and in a period of extremely cold weather might still be in difficulties. It was essential, therefore, that they should be allowed to expand their programme until they reached a position where they could not only confidently meet the load, irrespective of the conditions in which it arose, but also do something to replace much of the old and inefficient plant which was still in operation in this country. There was nearly 3,000,000 kW of plant over 25 years old and the replacement of two-thirds of it would enable the industry to make substantial savings in fuel. In the absence of extremely cold weather, however, they should be able to carry on without making cuts of any consequence.

The electrical industry was very conscious of the need to maintain exports, but some competitors were assisted by their Governments to give very long-term credits to their foreign customers, which were often of much more importance to those customers than the price or the efficiency of the plant. British manufacturers, on the other hand, received nothing approaching such help from the Government of this country. The Government could do much more by giving the necessary export facilities than by trying to force manufacturers to make greater efforts in the export market by preventing them from manufacturing for the home market.

The steel industry, to which Sir Archibald Forbes was now returning, and the electricity supply industry had in common the fact that both had been nationalized, though the steel industry was now being de-nationalized. There had been much conflict on the

question of nationalization, but it would be disastrous for any industry to become the plaything of politics, liable to have its organization changed with every change of government.

The toast of the guests was proposed by Mr. P. V. Hunter, immediate past-president of the Convention, and responded to by the Mayor of Torquay, Ald. P. T. Read.

Electrical Forum

Repeating the successful experiment initiated at the fourth Convention, an "Electrical Forum" was held on Friday, when questions sent in by delegates were answered by a panel the members of which had not seen them beforehand. The President acted as "question master," and the panel consisted of Mr. J. Eccles (Merseyside and N. Wales E.B.), Mr. E. W. G. Golding (E.R.A.), Dame Caroline Haslett (E.A.W.), Col. B. H. Leeson (B.E.A.M.A.), Mr. S. F. Steward (South Western E.B.) and Mr. E. R. Wilkinson (E.D.A.). The questions and a summary of the answers are given below.

Windmill Generators

Has any further progress been made in the utilization of windmills in producing electrical power and, if so, in which areas are these developments most likely to succeed?

Mr. Golding said that considerable progress had been made since the war. One 100 kW generator had been erected and was under test and another was about to be erected. He added that a 250 kW machine was being designed, and the design of a 1,000 kW machine was being seriously considered. A general design study had shown that the most economical size might be of the order of 3,600 kW, and that the cost of producing energy by such a machine would be about $\frac{1}{4}$d/kWh. The western coastal districts and Wales were the most windy areas; Cornwall had been tried, but found to be not so good.

Electrical Exhibition

Having regard to the many exhibitions held in conjunction with the electrical industry, would it be wise to organize within the industry one annual exhibition, at Earls Court or Olympia, instead of the present expensive and disjointed method?

Mr. Steward thought that to put over the whole electrical case with the right "punch" a single exhibition, perhaps held once every three years, would be useful.

Col. Leeson said it would mean a colossal exhibition, and an exhibition tended to fail when it was so large that it was physically impossible to walk round it. He thought it was wiser for the electrical industry to link itself to the other industries which it served and where its main customers were to be found.

The President said that the industrial field was already well represented by different exhibitions in which there should continue to be electrical co-operation, but possibly the domestic and rural electrification fields were not so well covered and might be the subject of limited exhibitions.

Dame Caroline Haslett suggested that, while taking part in the exhibitions of other industries, once every three or five years the electrical industry should stage a first-class exhibition, probably sectionalized, which would make an enormous impact on the public. This should be done fairly soon, to bring people back to the idea of the all-electric home and change the attitude adopted during the last five years.

Mr. Wilkinson referred to the exhibition built up by the Association of Supervising Electrical Engineers over the last three years which had shown the need for a larger and better exhibition than any which had been held so far.

Mr. Eccles suggested the holding of a sectional exhibition in London, perhaps annually, so that over a period of years all aspects of the industry would be covered. This should be supplemented by local exhibitions in the provinces.

Mr. Golding wanted an exhibition dealing with rural electrification to be taken round the country, and Col. Leeson suggested that this might be done by participating in the various agricultural shows.

The President said that the exhibition organized by the A.S.E.E. might perhaps be taken up by the industry in general, and that the manufacturing and supply sides might discuss this possibility.

Off-Peak Tariffs

Should the B.E.A. take early steps to give a special bulk load night tariff to Area Boards to enable the Boards to sell off-peak units at a more competitive tariff and encourage the consumer to spend money on plant to use electricity off peak?

Mr. Eccles pointed out that if only half the consumers elected to be charged on a differential day and night tariff the cost of

The panel at the Electrical Forum

Left to right: Mr. S. F. Steward, Col. B. H. Leeson, Dame Caroline Haslett, Sir John Hacking, Mr. J. Eccles, Mr. E. R. Wilkinson and Mr. E. W. Golding

the metering equipment would run into tens of millions of pounds, to get the benefit of something like 0·05d/kWh on the energy taken at night. In some large industrial applications it might be justifiable.

Mr. Wilkinson agreed that the differential, on a true cost basis, would be about 0·05d/kWh, reflecting the more efficient generation at night when the less efficient generating plant was not in operation. To get the same overall revenue as before, however, the present average running charge would have to be somewhat increased for daytime consumption and somewhat reduced at night. Any advantage of the differential to Area Boards might be offset by the difficulty and expense of passing it on to consumers.

The President referred to the Ridley Committee's recommendation that night load should be encouraged, and said that its other recommendation, that tariffs should be related to true costs, militated against this, because the marginal difference might be too small to give the result required. At the same time, the urge to improve the load factor came not only from the Ridley Committee but from the economic situation of the industry.

Mr. Wilkinson maintained that the industry had done everything possible to that end, with the result that to-day the load factor was 45–50 per cent, as compared with half that figure 25 years ago.

Mr. Steward said that if the Authority were to get the same overall revenue, getting back by day what it gave away at night, there was a danger of prejudicing the present cooking and water-heating loads by chasing a night load which could be obtained only by a substantial differential, which it was clear could not be given.

Dame Caroline Haslett emphasized that before introducing such a differential tariff it was necessary to provide the domestic apparatus which would enable the consumer to benefit by it. Mr. Golding added that such equipment must be reasonably priced, or it would not be worth while for the consumer to spend the money to obtain a reduction of 0·05d/kWh.

Col. Leeson said that the way to bring back this country to prosperity was to use the electricity by working night shifts, and that was where the load should be found.

Farm Supplies

As an expansion of farm supplies is so much dependent on maximum use, would this result not be helped by installing equipment on trial in a small number of farms ?

Mr. Steward said that this was being done in his area wherever the equipment was suitable, and they had never had it back after leaving the farmer to try it, but care must be exercised in choosing the equipment and the farmer and the right application.

Mr. Eccles said they would be prepared, on a sale or return basis, to equip a number of farms if the farmer were willing to allow the equipment to be used for demonstration purposes, but there must be some time limit.

Mr. Golding agreed that this was a good way of popularizing a new device or technique, but emphasized that, unless it was very simple, someone should look after it and help the farmer for the first few months, because a great deal of harm could be done by leaving a man with limited electrical knowledge to deal with something which was quite difficult.

Another questioner asked how the panel viewed the tendency for British firms to establish manufacturing branches in the Dominions, and in general the panel was of opinion that this was desirable in certain cases where competition would otherwise be difficult.

Asked for their opinion on the possibility

of supplying sparse rural areas by single-phase lines with earth return, the panel agreed that it was probably not a practical proposition, particularly from the point of view of safety. "Technically," Col. Leeson remarked, "it has not been either developed or justified."

On the question of whether there was scope in this country for the American system by which housewives could rent deep freeze lockers at their stores, Dame Caroline Haslett recalled seeing this in operation in Chicago in 1936. In this country, she said, it began to be taken up in 1946, largely in market towns, and she had been told that in the Eastern Counties alone 6,000 of these lockers had been installed. Mr. Wilkinson, on the other hand, said that the system was now on its way out in America, since manufacturers there were incorporating deep freeze compartments in their refrigerators.

Rural Extensions

When negotiating with rural communities for mains extensions where contributions are required based on estimated revenue, how would you deal with the individual who unblushingly reveals his intention to wait for the mains and then demands to be connected thereto ?

Mr. Eccles said that when they went into a new district they asked for a contribution based on the acreage of the farm. They could not ask for a contribution related to the length of line, since they did not then know where the line would be placed; it depended on who took the supply. They warned people that once they were clear of the district it would be a long time before they came back again, so that probably those who did not take a supply at the time would not get it. If a new man took over a farm from someone who had refused a supply he was offered a supply on the original terms, based on acreage.

Mr. Steward said that their method was to survey a group and then call them together with some local man in the chair, and the members largely persuaded one another, since the scheme stood or fell by the support which it received. The contribution was on a group line rental basis, and if anyone stood out and wanted to come in later he had to do so on the same line rental basis.

The President, in acknowledging a vote of thanks to the panel proposed by Sir John Dalton, said there would be general agreement that the Forum had come to stay as a regular feature of the Convention.

Annual Meeting

The Convention concluded with the annual general meeting, held on Friday, with the President in the chair. The report of the Council and the accounts were adopted without discussion, and the list of nominations for the new Council approved with one amendment, announced by the President, namely that the E.D.A. nominated Sir Henry Self, its president, in place of Dame Caroline Haslett, who was already on the Council as a member of the E.A.W. The auditors were reappointed, and new rules, which the President said represented no fundamental change but merely a "tidying-up process," were adopted without discussion.

The President submitted the Council's nomination of Mr. J. R. Beard, C.B.E., as President for the ensuing year, to take over at the conclusion of the annual general meeting, and the nomination was accepted with acclamation. Mr. Beard, responding, said he felt he was acting as a representative of a section of the industry, the consulting electrical engineers, who had done a great deal in the last half century to promote the development of electricity supply and the improvement of electrical apparatus. The fact that their representative had been elected President showed how thoroughly the Convention was living up to the ideal enunciated by its first President, Lord Citrine, of representing the industry as a whole.

He also mentioned that when in South Africa recently he had conveyed the greetings of the B.E.P.C. to a meeting of the Association of Municipal Electricity Undertakings of Southern Africa and given a short talk on the British Convention. The South African body, which was modelled on the old I.M.E.A., had asked him to convey their heartiest good wishes to the B.E.P.C.

The President then invested Mr. Beard with the presidential badge of office.

The President also announced that the Council had nominated Sir Harry Railing as vice-president for the ensuing year. Sir Harry, he said, was president of B.[illegible]A.M.A. and chairman and joint managing director of the General Electric Co., Ltd. He had played a prominent part in the affairs of

that company for the last forty years and was an electrical engineer of distinction. His services had been in great demand by organizations connected with industry in general and the electrical engineering industry in particular, and whenever he had undertaken such duties he had given all his energy and enthusiasm to the task. Unfortunately, before he was approached with a view to becoming vice-president he had made arrangements which rendered it impossible for him to attend the present Convention. The nomination was accepted with acclamation.

On the motion of Mr. E. C. Holroyde, seconded by Mr. J. O. Knowles, both representing B.E.A.M.A., a resolution was unanimously adopted that the meeting, being of opinion that the electrical industry was making an important contribution to the economic recovery of the country, and that it had an even greater contribution to make in the future, resolved that the utmost publicity be given to the papers and proceedings, and that as an immediate step the President's address and the theme paper on "Electricity and National Prosperity" should be sent to all members of both Houses of Parliament.

The President, replying to a suggestion by Dr. E. H. Rayner (E.R.A.), promised that the Council would consider the possibility of making an abstract of the whole proceedings of the Convention so that they could be given wide circulation.

The customary votes of thanks to the Mayor and Corporation and the officials of Torquay, and also to Mr. S. F. Steward, the chairman of the South Western Electricity Board, to Mr. A. W. Allwood, the district manager at Torquay, and to the firms which had presented prizes at the dance, were carried with acclamation.

Sir Vincent de Ferranti proposed a vote of thanks to Sir John Hacking, the retiring President, and asked leave to include Lady Hacking in the vote. Their thanks were due to Sir John, he said, for his most instructive and interesting address, for the way in which he had conducted the meetings, and for the atmosphere of efficiency and charm which he had given to the Convention. The vote of thanks was carried with prolonged applause and briefly acknowledged by Sir John Hacking.

It was announced that the 1954 Convention would be held in Eastbourne during the week commencing 14th June.

Electricity and National Prosperity

THE discussion on the paper bearing this title which was read by Col. B. H. Leeson, C.B.E., at the afternoon session of 9th June was summarized in our last issue. A somewhat fuller report of the discussion appears below.

The opening speaker was Mr. J. Eccles (Merseyside and N. Wales E.B.) who said that the proper answer to the question "Can we afford additional electricity?" was "Can we afford not to have it?" Could it be said that a community which spent 16 per cent of its total outgoings on alcohol and tobacco could not afford to spend more than the 1·5 per cent which it spent at present on domestic electricity? By reducing the expenditure on alcohol and tobacco by one-tenth, domestic electricity consumption could be doubled. On the industrial side the cost of electricity for various typical industries was only 1 per cent of the value of their gross outputs, taken as an average. If doubling the quantity of electricity used in industry were to increase the output by only 25 per cent, the cost of electric power would still be a very small proportion indeed in relation to the extra output obtained.

Would a doubling of the amount of electricity used in industry enable industrial production to be stepped up by 25 per cent? That would depend on its proper use. Three things were needed. First, those in control must demonstrate that they were working hard and effectively. Secondly, wherever possible production should flow from one end of the factory to the other as a group responsibility; where it was coupled with group bonus payments the laggard became the enemy of the group. Thirdly, people must have the right to spend a greater proportion of their earnings in whatever way they chose, instead of having them halved by taxation and quartered by purchase tax.

While for many important commodities

the price increase compared to 1938 ranged from 300 to 600 per cent, and for none was less than 100 per cent, the average price of electricity in his own area had increased by only 23 per cent.

Greater Production Needed

Mr. H. W. Bosworth (B.E.A.M.A.) urged the necessity for greater production per head, by harder work, longer hours or, both, and for fewer non-producers both inside and outside industry. All industries, and the nationalized industries not the least, should eliminate the form-fillers and the time-wasters. "I would urge on the Government," he added, "the abandonment of that vastly expensive, time-wasting monopoly inquiry, for which all of us have to pay." There should be greater concentration on the types of work for which we were best fitted—scientific work, research and the production of high-quality goods. It was no use trying to compete in mass-produced goods with cheap labour abroad.

There must be an abolition of all restrictive practices, an end to the penal taxation of undistributed profits, and some review of the demands of military service. There should be a ruthless use of this country's purchasing power to secure the entry of our goods into foreign markets. "My reply to the recent action of the American authorities in connection with certain electrical tenders," he said, "would have been to close the whole of the British market to American films and tobacco." Unless the Americans genuinely intended to expand their trade with us, we must learn to do without America and concentrate on trade with other countries.

Mr. W. A. Coates (B.E.A.M.A.) thought there would be general agreement that the greater availability of electricity in the past would have increased our chances in the export field to-day, and would still do so, but to some extent the position had changed since the end of the war. The electrification of our main line railways was an attractive idea, but where was the money to come from? The cost would be of the order of installing another 500 to 600 MW of generating plant, and the Treasury would never consent to that. Customers abroad were asking exporters to finance their purchases—the sort of thing which we ought to be doing for ourselves but could not afford to do.

Most people in managerial positions worked longer hours than their subordinates, and when they did so they should make the fact obvious. They should also undertake self-examination and make sure, for instance, that they were not calling for unnecessary reports. By a little study, senior executives should be able to cut the amount of paper work in their organizations by from 10 to 30 per cent.

Mr. D. Maxwell Buist (B.E.A.M.A.) pointed out that before the war the ratio of home to export trade in the electrical industry had been about 85/15, and was now perhaps 60/40. He hoped that that proportion would be maintained and that the export proportion of the total would not go up any further, but that both totals would go up in proportion, to avoid the unhealthy condition of a very poor basic home industry. If home demand were to increase pro rata with exports there must be a removal of restrictions on capital investment, the lowering or abolition of purchase tax and a removal of restrictions on hire purchase. Colonel Leeson's figures showed that while the total tonnage of goods produced had doubled since before the war, the tonnage of overseas exports had been multiplied by four times at least.

Mr. H. Midgley (South Western E.B.) did not agree that exhortation was useless as a means of increasing productivity, and pointed out that half the trouble in the industrial world to-day was due to exhortation, but exhortation from the wrong people. More thought should be given to the problem of good exhortation to counter this.

Encouraging New Ideas

Mr. W. H. Dunkley (Yorkshire Division) emphasized the need for the stimulation and reward of inventiveness. There was a common saying that the Swiss lived by exporting their brains, but there seemed too great a tendency in this country to live by importing other people's brains. Did we tend to offer too great a resistance to new ideas? It was difficult to get any substantial reward for the application of ingenuity in the service of a big organization.

Mr. J. R. Harding (C.M.A.) suggested that as many overseas customers could only pay for capital equipment when it began to earn money for them, a body such as the Convention could with advantage tell the Government that a wider measure of support than that afforded by the Export Credits

Department would be of great value. The Government should be urged to reduce the rate of purchase tax as much as possible and then leave it unchanged for a period of years, in which case customers would tend to forget it.

Mr. G. F. Moore (S.E. Scotland E.B.) said that it would be impossible to have a large programme of capital investment while maintaining the supply of consumer goods unless people were prepared to work longer hours; shift work would not be a solution. It would also be necessary to reduce the number of non-producers; it was said that under 8 million of our 45 million people were really producers.

Colonel Leeson briefly replied to some of the points raised.

Electricity and Industrial Production

SUMMARIES of the four papers comprising this group appeared in last week's *Electrical Review*. The papers were:—"Electricity and Industrial Production" by Mr. E. R. Wilkinson; "Electricity Supplies for Industry" by Messrs. A. O. Johnson and C. P. Holder; "Combined Electricity and Heat Supplies" by Messrs. H. S. Prosser and A. W. Pedder; and "Industrial Applications of Electricity" by Mr. T. B. Rolls.

Opening the discussion Mr. P. H. Goddard (E. Midlands C.C.) said that increased productivity would depend on the supply of cheap electricity, and for many years to come the electricity supply industry would have to depend on coal. While the price of electricity had not on an average been increased by more than 20 per cent, the price of coal had gone up by at least 300 per cent. It was ridiculous for one branch of the fuel and power industry to make all the efforts and all the economies, only to find them frustrated by another branch of the same industry.

Capt. J. M. Donaldson (E.D.A.) said that we might have to pin our faith to nuclear energy in the future; he did not think that other palliatives would play a large part. The efficiency of generation was increasing steadily, but there was a limit to what could be done in that direction. The only real way out of the difficulty in which we found ourselves was to work harder.

Dr. J. N. Aldington (E.L.M.A.) did not think that the effect of lighting on industrial production had been sufficiently emphasized in the papers. The tungsten filament electric discharge lamp and fluorescent lamps had all reached or were rapidly approaching the limiting values of efficiency, and, while research workers were striving not only to improve the level of efficiency but to seek for radical developments, at the moment no such developments were likely or had even been suggested theoretically. Much remained to be done, however, in applying the sources available to improve industrial efficiency. The objective should be a lighting installed load of the order of 4 watts/sq ft, leading to a figure of about 100 lumens/sq ft at the working plane, and there was a case in the design of new factories for considering the contribution which these higher illumination levels could make to the heating load of the factory. Much fatigue, unrest and irritability stemmed directly from poor illumination.

Mr. R. A. S. Thwaites (N. Western E.B.) said that consumers with a load factor of 1 per cent must provide a very high diversity of demand, while, at the other extreme, consumers with a load factor of 100 per cent provided no diversity whatever. The question arose of whether in the latter case one should transfer from the theoretical two-part tariff some of the fixed charges to running charges, and whether with very low load factors it would be reasonable to have "ceiling" prices.

Mr. J. O. Knowles (B.E.A.M.A.) emphasized that motor control gear was a well-established form of l.v. distribution when arranged in switchboard form. The versatility of such boards was so great, however, that the buyer could call for a large variety of features, so that most boards had to be "tailor-made." Manufacturers of switchgear and control gear would welcome all that the supply industry and other industries could do to help towards some measure of standardization. Contactor switchboards provided a reasonable alternative to the circuit-breakers and switch fuses mentioned by Mr. Rolls, and he looked

forward to more co-operation between the manufacturers and the users in limiting the variety of the requirements which affected auxiliary circuits.

Mr. Bryan Donkin (A.C.E.) suggested that the best field for the application of heat-electric generation was its application to domestic premises, which should give a comparatively good annual load factor compared with applications to industry. He had recently investigated the possibility of steam and electric supplies in a number of Lancashire and Yorkshire textile works and found that it would be uneconomic for them to put in their own generating plant, simply because there would not be an adequate return on the capital expenditure. With factories working three shifts the picture changed, especially with new factories, where the steam-using plant could be designed to take steam at low pressures and temperatures. For domestic heating, to maintain a temperature of 65 deg F in living rooms the calculations must be based on a continuous minimum ambient temperature of 30 deg F, but with properly-designed plant the input of heat could be varied during the day to avoid supplying excess heat. It was possible to make a reasonably accurate estimate of the requirements for domestic premises and therefore dispense with metering. If the conventional electric heating load were allowed to grow unchecked it would have disastrous effects on the plant installation programme of the B.E.A., and therefore, although district heating might be regarded as a nuisance, he thought that the B.E.A. should grasp the nettle firmly.

Promotional Advertising Essential

Mr. A. M. F. Palmer, M.P. (Employees' National Committee), referring to Mr. Eccles' suggestion in an earlier discussion that the average man could afford to spend more on electricity if he spent less on drink, suggested that it was not the business of the electricity supply industry to dictate the pattern of consumption in a free society; nor was he impressed by the urge to work longer hours. It was countries with the lowest standards of life that worked the longest hours. It was necessary, however, to work hard and efficiently when at work, and to do that full use must be made of electric power at every stage of the productive process, as the Americans did. The electricity industry was handicapped not only by Government restraint on promotional advertising, which was to-day quite shocking, but by its own meek attitude to its critics. It should be made clear in Parliament and elsewhere what the electricity industry could do and was doing to improve productivity.

Mr. H. W. Swann (Senior Electrical Inspector of Factories) said he had been told by the chief engineer of a large industrial concern that over the past three years his organization had spent £230,000 on switchgear replacement owing to the rise in the general fault level of the supply. Anything that could be done to peg fault levels would encourage the industrial consumer. He wondered whether in the not too distant future circuit-breakers would be replaced by fault current limiters.

He also wondered whether in time there might not be a tendency to swing away from the very large turbo-generator to smaller sets to provide combined heat and electricity.

Back-Pressure Installations

Mr. J. I. Bernard (E.D.A.) suggested that one important reason for the high American figure of horse-power per worker was not that the horse-power per machine was higher than in this country but that an operative looked after a greater number of machines. On the question of combined heat and electricity supply, he pointed out that in factories it was almost always necessary to renew the steam piping and steam-using appliances to make them suitable for a pressure of, say, 15 lb/sq in, which was the most economic back pressure from the point of view of generating plant. That added considerably to the capital cost, and his broad conclusion was that all the back-pressure installations likely to be financially successful under present conditions of taxation and so on had probably been installed already. He believed it was possible to have a good deal more electronic control and referred to the latest blast-furnace skip hoisting and charging plant in which the pressing of a button started a sequence of 700 operations, all done automatically and arranged to charge the furnace with the right amount of material in the shortest time.

Mr. A. N. Irens (I.E.E.) agreed that one reason for the industrial consumption per worker of electricity being lower in this country than in the U.S.A. lay in the

mechanization provided but in its use, since in this country we had one operative per machine and not one man looking after two or three machines. We were hardly at all behind the Americans in mechanization, except perhaps in materials handling.

He thought that Messrs. Johnson and Holder understated the case for public supply as opposed to private generating plant, but urged public supply engineers to adopt a fresh approach to the question of parallel running. Many industrial engineers felt that it was no use discussing with public supply engineers the advantage to be gained mutually by parallel running. It was desirable that the electricity supply engineers should get into touch with many factories which generated their own power and see whether it would not be in their interest and in the interest of the supply authority to operate a parallel supply.

Mr. J. W. Moule (S.E. Scotland E.B.) was disappointed that so little was being done in the off-peak use of electricity for space heating, since it would not only bring about a substantial improvement in load factor but do much to secure increased productivity. Electrical floor warming in particular was giving very promising results in his area. The initial cost of installation was only two-thirds that of the cheapest alternative, and by providing warmth where it was needed it improved productivity.

Miss M. V. Griffith (E.R.A.) expressed surprise that so little was said about the heat pump in the paper on combined heat and electricity supplies. It would be unwarrantable to obtain the impression from this paper that the heat pump was not worth consideration for district heating.

Mr. E. A. Logan (Southern E.B.) quoted the late Lord Fisher's dictum that "Reiteration is the secret of conviction," and said that the electrical industry had not really begun in the wide world outside to reiterate the electrical message. Many applications of electricity by manufacturers had not been initiated by the electrical industry, but when examined in detail were surprising in their ingenuity. The electrical industry should show them the way.

The authors briefly replied, Mr. A. O. Johnson remarking that there was a tendency to be obsessed with the idea of parallel operation without realizing that in many cases change-over operation was almost equally satisfactory.

Electricity and Food Production

THE group of four papers on this theme was discussed as a whole. The papers, which were summarized in our last issue were:—"Electricity and Food Production," by Mr. S. F. Steward; "Electricity for Agriculture," by Mr. C. A. Cameron Brown; "Electricity for Horticulture," by Mr. A. W. Gray; and "Electrical Equipment for Food Production," by Mr. F. E. Rowland.

Mr. J. T. Beresford (S. Western C.C.), who opened the discussion, said that if the other Area Boards (excluding London, which had all six of its farms connected) had made since vesting day the same progress as had been made in the South Western Area, more than half of the farms of the country would by now be electrified, instead of 42 per cent. The wealthier Boards with less responsibility for rural areas should support the less wealthy Boards who were trying to carry out their duty under Section 1 of the 1947 Act, to bring electricity as far as practicable to everyone in the country. Since the war 10,000 farm workers had left the land every year; it was not the farmer alone who needed electricity but the whole of the rural population.

After six years of connecting farms at the rate of 1,000 a year Mr. Steward had reached a position where only one-third of his job was done, and he was forced to admit, at least in private, that he might not be able to proceed much farther. Other Boards with large rural areas would before long find themselves in the same impasse. The solution seemed to be to interpret Section 36 of the Act more liberally; this was a national matter. The Central Authority might well make the 33 kV lines a national charge on the whole

industry, and something should be done about the bulk supply tariff to help the rural Boards. If ultimately some form of subvention must be faced, the time to begin thinking about it was now.

Scope for Farming Expansion

The Rt. Hon. Thomas Johnston, P.C. (chairman, N. of Scotland H.E. Board) said that in his area there were hundreds of thousands of acres of grazing land, at present hardly used, which could raise enormous herds if winter feeding could be provided. They had been trying for the last four years to produce an electric hay drier or grass drying machine to improve the yield and the protein value of the hay which was cut, and had met with encouraging success; three of the four farmers who took part in their experiments last year had bought the plant. This year they were going to seven other farms and trying to get a group of crofters to send their hay to a common drier. The increase in productivity was astonishing; one farmer testified that for a capital expenditure of £500 he had saved £883 in one year on concentrates and by the increased value of his sheep, while another said that electricity had been the equivalent of two extra hands on his farm. Losses by the traditional method of drying hay amounted to 40 per cent; electric drying had halved this loss, while the protein losses, which were anything from a fifth to a half, had been reduced to almost nothing.

Mr. J. S. Pickles (S.W. Scotland E.B.) maintained that there had never been a time in the history of the electrical industry when more active and excellent rural development was being carried out or when more was being done to help the "lame ducks." For example, 70 per cent of the working costs were due to the bulk supply tariff, and every Area Board paid the same tariff, so that some Boards paid more than they would otherwise have done in order to help the others. He had been concerned with rural development for nearly twenty years and had lived in perpetual fear of a deficiency, but it had never occurred. In eight years from the vesting date the supply industry would have connected as many farms as had been connected during the previous 48 years. He thought that much of this development should be done on the single-phase system. Much construction was still being done three-phase, which was too expensive. Prosperous industries like electricity and agriculture could not ask for subsidies, which meant "strings" and a weakening of the feeling of responsibility for the Areas. The Areas had been wisely chosen to comprise urban, industrial and rural areas and each should be able to carry its rural development without undue imposition on urban consumers.

Mr. A. W. Ferguson (Northern Ireland Board) said that in Northern Ireland, after initial losses, they were beginning to make rural electrification pay. He thought it could be made to pay, but the Government must not ask for it to be carried out in five minutes.

Mr. J. A. Duncan (Merseyside and N. Wales E.B.), speaking as a member of the National Farmers' Union, said that one reason for the low consumption of electricity on farms was that for high farming long-term confidence was required. Far greater security must be given to the farmer. The commercial side of the electrical industry must carry out more propaganda, and the E.A.W. could help here through the Women's Institutes. Manufacturers of electrical goods should make a greater effort to reach the farmers. Farming to-day depended almost entirely on the use of imported oil. If it were possible to substitute electric for oil tractors, charging their batteries at night, it would provide a magnificent load for the supply industry.

South Western Scheme Commended

Mr. F. W. Godden (E. Midlands E.B.) commended Mr. Steward's line rental scheme as a new approach to the problem of obtaining a minimum continuing revenue and as being likely to be more easily understood and accepted than the system of a minimum revenue guarantee over a period of years. It might well, he thought, be considered for national adoption. The modern farm tractor was an exceedingly versatile machine and the possibilities of an electric tractor should be investigated.

Owing to lack of time it was estimated that the authors would reply to the discussion in writing. Sir Henry Self, in proposing a vote of thanks to them, emphasized that the electricity supply industry was very keen on rural development. The Central Authority provided the "backbone and ribs" all over the country and

the new points of supply asked for by the Areas, so that all that the Areas had to worry about were the costs of supplying the spur connections. The Central Authority had also equalized within the regions the running charge, the only differential being the price of coal.

In the last six years of rural development the first band and part of the second had been dealt with. In Band 1, that which was economically practicable, their predecessors had done a good deal. Band 2, that which would eventually be economic after a period of development, was being actively tackled, and the fear of capital restriction had been in part removed; they now had reasonable freedom within the overall limit of the capital available for the industry as a whole. The industry would have to work out for itself whether any joint treatment of Band 2 was necessary or not. Band 3 consisted of the field which could not be made economically practicable within a foreseeable time, and on what should be done with this Sir Henry did not offer an opinion.

E.A.W. LUNCHEON

ABOUT 400 members of the Electrical Association for Women and guests assembled at the Town Hall on 10th June for the Association's annual luncheon, under the chairmanship of the Dowager Lady Swaythling, the president.

In the course of a witty speech Lady Swaythling, proposing the toast "The Borough of Torquay," referred to the election of Dame Caroline Haslett, director of the E.A.W., as chairman of the British Electrical Development Association. She also welcomed Sir John and Lady Hacking, Miss Margaret Hyndman, Q.C. (Canada), and the Mayor and Mayoress of Torquay. She extolled the amenities of the town and said that Torquay had been chosen as the place for the Association's 1954 conference.

Replying to the toast, the Mayor said that the local branch of the E.A.W. was very live and active and always first and foremost in promoting local good causes under the guidance of its chairman, Mrs. Gresham. He congratulated Lady Swaythling on her appointment as an O.B.E.

Miss Margaret Hyndman, who is an eminent member of the Canadian Bar, proposed the toast "The Electrical Engineer." She said that as a member of one profession she was glad to have the opportunity of saluting a prominent member of another, the engineering, profession, Sir John Hacking. Miss Hyndman spoke of the significance of the Coronation and went on to refer to the important part played by electricity in Canadian life.

Sir John Hacking, in his response, also congratulated Lady Swaythling on behalf of the electrical industry. It was difficult, he said, to choose any particular contribution which the electrical engineer had made to social progress, for he had been responsible for a great many revolutions—including communications, lighting, traction and in home life, the aspect with which the E.A.W. was concerned and for which they shared the credit. Remote sources of energy could only be developed electrically and the same was true of nuclear energy which must eventually take the place of coal. Among other virtues of electricity Sir John mentioned its help in reducing atmospheric pollution. Electricity, by making possible radio and television, was also responsible for a mental revolution. Electronic control devices acted with the rapidity of thought. Sir John concluded with an appreciative reference to Miss Hyndman, the second Commonwealth woman to become a Queen's Counsel.

NEXT WEEK'S EVENTS

Monday, 22nd June, to Wednesday, 24th June

BOURNEMOUTH.—Electrical Contractors' Association. Annual conference.

Tuesday, 23rd June

SANDMOOR.—I.E.E. North Midland Centre. Annual golf competition.

Tuesday, 23rd June, to Friday, 26th June

ALLOA.—Royal Highland Agricultural Show.

Thursday, 25th June, to Saturday, 27th June

LONDON.—Royal Scottish Corporation Hall, Fetter Lane, E.C.4. Model Tramway Exhibition.

Thoughts on Torquay

By a Delegate

THE practice that has been followed in the British Electrical Power Convention, of directing the papers towards the study of a theme, lends cohesion to the occasion, and improves the quality of the discussions. During the Torquay Convention, authors and speakers brought out prominently the following points: (1) Everyone must work harder; this will almost certainly necessitate working longer, and working in shifts. (2) Small savings are insufficient, and must be increased. (3) Purchase tax spoils the home market, and a flourishing home market is an essential pre-requisite to a good export trade. (4) Manufacturers must be allowed to invest their profits in their undertakings—some of the most prosperous in our industry have been built up in this way, and that quickly. (5) Restrictions on capital investment must be eased and, as soon as possible, removed.

These sound so praiseworthy that it may be thought that they will all be adopted immediately, and some appear so obvious that they hardly need to be mentioned. It will be useful to consider them briefly, to find what obstacles exist. One speaker said that it was the communities with the lowest standards of life that worked the longest hours; another said that "other chaps must work harder so that we may continue to live as we do." The question of the length of the working week and the arranging of the five-day week do certainly need consideration. It is improbable that the practice of making Saturday an overtime day was envisaged when the five-day week was brought in; and we now see large numbers of people choosing to work six days, because that is what has happened.

One of the obstacles to small savings is the continuous fall in the value of money. Many people prefer to buy things by instalments than to save up in advance and then find prices have increased. It is often necessary to draw on savings for expenditure that is a little out of the ordinary. Moreover, we remember that when certain arrears were being paid to the medical profession the notion of equivalent value came into the calculation. And it could happen that a Government might freeze savings—already it has been stated that a debt of £6,000 million, payable at call, is an unpleasant prospect for a Chancellor of the Exchequer; and that is what our small savings mean.

The criticisms of purchase tax are sound—it is a bad tax because it interferes with trade. How we used to despise Continental nations which imposed it! Yet Mr. Butler told us during the week of the Convention that he could not afford to do without it. That is also the answer to suggestions to remove or to reduce the damaging profits tax.

Capital expenditure can be described as a mortgage on production. We invest money in order to produce goods to sell and bring profit; but confusion of thought must be present when it is said that the statement that capital cannot be provided for a particular purpose means that no labour is available for that purpose.

On the whole, the Torquay event was one of the best Conventions in a long retrospect and it was very well managed.

Fuel Research Aids Industry

SPEAKING as president at the annual meeting of the British Coal Utilization Research Association last week, Sir Charles Ellis, F.R.S., scientific member of the National Coal Board, said that the Association could give many specific examples of the extent to which they were now feeding the fruits of their research back into industry. They had been investigating the possibilities of surmounting one of the serious problems of to-day: how best to use the finer sizes of coal, often with an ash content appreciably above the average, by burning such coal by a cyclone method to provide the hot gases for driving a gas turbine. A prototype based on the second experimental combustion chamber on which they had worked in the Association laboratories was already undergoing development in the works of a member firm.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Convection Heaters

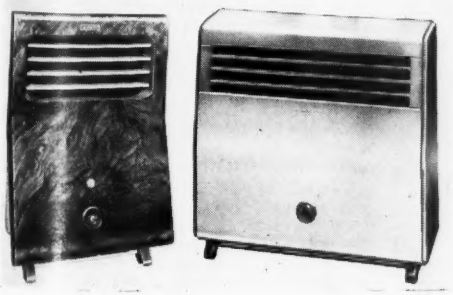
FOR the first time since they were introduced over sixteen years ago by E. K. COLE, LTD., Southend-on-Sea, a major change has been made in the design of the floor-standing "Thermovent" models and new wall models have been introduced.

The basic principles of the system are retained but important new features are incorporated. Those common to both types of heater include a larger and more efficient duct system with a greater cross-sectional area than in previous models, thus providing a considerable increase in the circulation of air through the heater and a still lower temperature at the outlet grille. By this means a remarkably high convection efficiency has been achieved and a correspondingly enhanced standard of safety, both cases and grilles remaining exceptionally cool.

Models are available with either switch or a new automatic heat control which includes adjustable limit stops with a special locking device. The thermostat operates in its own cool air stream in a separate duct, resulting in a rapid response to any change in room temperature. These new floor-standing models have a warm luminous effect produced by a standard type 40 W lamp.

The "FR" models (1 and 2 kW) have a walnut plastic front panel with a new type "easy-clean" metal grille finished in durable old-gold enamel. A red pilot lamp indicates the action of the thermostat. The "SR" models (1, 2 and 3 kW) are housed in steel cases finished in high gloss light bronze stoved enamel. They should have an appeal to domestic as well as commercial and industrial users, for whom the models are primarily intended. Though designed for floor-standing, they have holes at the back for wall fixing.

Thermovent FRC1 and SRC2 heaters



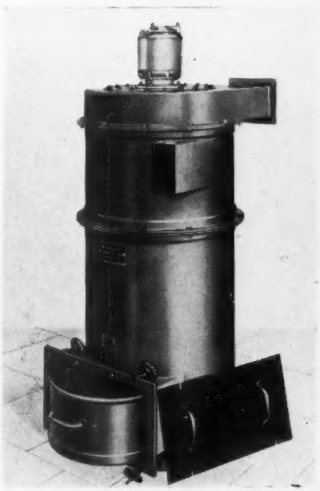
Marine Floor Scrubbing Machine

A modified version of the "Vulture" floor scrubbing machine is now available from CIMEX-FRASER TUSON, LTD., Cray Avenue, Orpington, for use on board ships for cleaning decks. This new machine is identical with the original model except that the motor is fully waterproof, the extra weight involved incidentally being an advantage for the type of work undertaken. The new model costs £175, as compared with £150 for the standard machine.

Dust Arrestor

The problem of collecting dust from individual machines installed at appreciable distances from each other, making a composite dust exhausting plant impracticable, is met by the "Uniclone" dust arrestor made by the STURTEVANT ENGINEERING CO., LTD., Southern House, Cannon Street, London, E.C.4. It comprises an exhausting fan beneath which is a high-efficiency cyclone

Sturtevant "Uniclone" dust arrestor



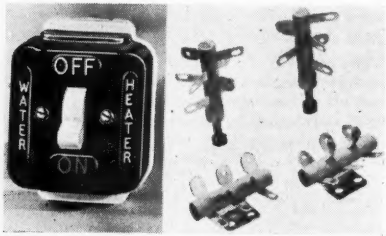
and dust bin, built into a cylindrical casing, which can be mounted upon a trolley to enable the exhaust to be applied to an individual operation on a range of machines.

In operation, dust laden air is drawn into the machine by the centrifugal fan and passed into the cyclone from which the dust is deposited into the removable dust bin.

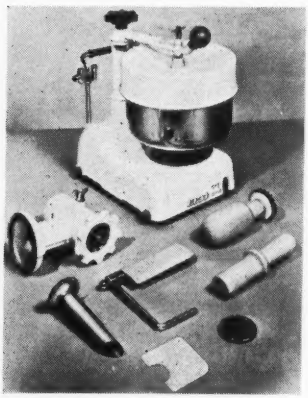
The fan is fitted with a scroll and arranged to discharge through a rectangular outlet which, in accordance with the Factories Act, can be connected to a further length of piping to discharge the air exhausted to outside atmosphere. Four sizes are made, known as 21in, 27in, 30in and 36in units, the capacity ranging between 450 cu ft/min in the smallest to 1,300 cu ft/min in the largest size. Power consumption is from ¾ h.p. to 2½ h.p.

Water Heater Switches

The 30 A double-pole water heater switches offered by J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham, 11, embody a.c. flashproof switch mechanisms operating on the slow break principle and incorporate two silver contacts in parallel on each pole to provide equal breaking and distribution of load. All live current carrying parts are mounted on vitreous porcelain. The attractive moulded covers are engraved with the words "Water Heater" picked out in white for easy identification, with dolly indication for "on" and "off." Wiring terminals are provided with outlets for end or back entry wiring as required.



Tucker 30 A water heater switch and (right) "Cactus" and "Porcupine" soldering tag mountings



H.M.V. model FM.2 food mixer

Soldering Tag Mountings

The two soldering tag mountings recently introduced by the UNITED INSULATOR CO., LTD., Oakcroft Road, Tolworth, Surrey, are known as the "Cactus" and the "Porcupine." They represent a new departure in the manufacture of this type of article, and are primarily intended for use in radio and electronic equipment. The "Cactus" has four live tags and can be mounted vertically, while the "Porcupine" has two earthing points and three live tags and can be mounted horizontally.

In each case the bodies are of porcelain and all metal parts are silver plated. A feature of both articles is that the tag strips can be removed and reversed or put into any variety of combinations that is required. The "Cactus" is 1·1in high when mounted, and the "Porcupine" 0·8in high and 1·1in long when mounted. The insulation resistance of these parts is better than 1,000 M and they are suitable for working at up to 750 V with a flash-over of 4·5 kV r.m.s.

Food Mixer

To meet the demand for a food mixer of a size between that of the small domestic and the bulky industrial types the H.M.V. Food Mixer Division of E.M.I. SALES & SERVICE, LTD., Hayes, Middlesex, has brought out the FM.2 light commercial machine.

Specially designed for use in hotels, restaurants, guest houses, schools, hospitals, works canteens and other catering establishments, it has a capacity of 6¼ imperial quarts, accommodating sufficient food for up to 40–50 people. Its versatility is illustrated by the fact that it will just as efficiently cream 4 oz of fats as it will knead nearly 10 lb of dough. Accessories make the machine suitable for grating, shredding, coffee grinding, juice extraction, liquefying and emulsifying, whisking, mincing, slicing and peeling. The price of the basic model, including mincer, is 39 gns. With accessories the price is £73 18s.

Cable Ship

Swan Hunter and Wigham Richardson, Ltd., have commenced work on the construction of a 3,300 ton cable ship for Cable & Wireless, Ltd. The new vessel, the twenty-third of its kind to be built by Swan Hunters, will be the largest in the Cable & Wireless organization.

COMMERCE and INDUSTRY

Heat Control Devices Committee

American Contract Award

A HEAT Control Devices Committee has been formed consisting of bona fide British manufacturers of thermostats, switches, and energy regulators for heavy duty and domestic electric cooking equipment, and for domestic water heating. For the present this is an independent committee, but it will work in close collaboration with the B.E.A.M.A., as well as with other kindred bodies. The present members are: Arrow Electric Switches, Ltd.; S. Davall & Sons, Ltd.; "Diamond H" Switches, Ltd.; Robert Maclaren & Co., Ltd.; Process Control Gear, Ltd.; the Rheostatic Co., Ltd.; Salford Electrical Instruments, Ltd.; Sunvic Controls, Ltd.; and Turnright Controls, Ltd. The chairman is Mr. R. W. Towers, of the Rheostatic Co., Ltd., the vice-chairman Mr. E. J. Harris, "Diamond H" Switches, Ltd., and the secretary Mr. Sidney H. Nayler, Kingsway House, 103, Kingsway, London, W.C.2.

Electric Motors for Canada

In the face of keen competition from American companies, David Brown & Sons (Huddersfield) Ltd., have secured a £15,000 order from the Aluminum Company of Canada Ltd. The order, which was negotiated by the Huddersfield firm's Canadian associate, David Brown (Canada) Ltd., of Toronto, covers the supply of 350 "Coventry" geared motors. These units, a standard product of the Coventry Gear Co., which was acquired by the David Brown organization in 1944, give a choice of seventeen output speeds ranging from 25 r.p.m. to 345 r.p.m. with input powers from 0·25 h.p. to 2 h.p. The geared motors included in the Canadian order will be used to raise and lower the electrodes employed in the reducing furnaces at the vast aluminium smelting plant which the Aluminum Company of Canada Ltd. is building at Kitimat.

Chief Joseph Dam Contracts

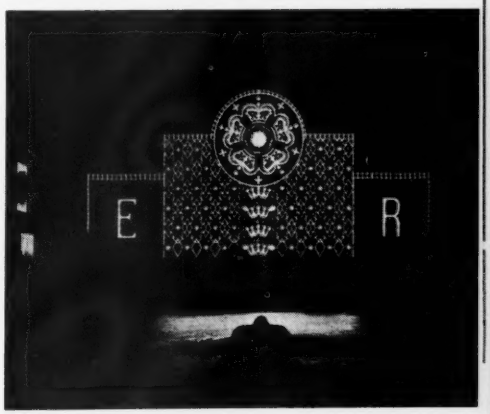
The Seattle Correspondent of the *Daily Telegraph* reports that part of the equipment for the Chief Joseph Dam is to be supplied by a British company and part by an American company. This decision has been announced by the Seattle district office of the Army engineers. The engineers have accepted the low bid of £629,000 submitted by the English Electric Export and Trading Co., Stafford, for ten transformers. They have also accepted the low estimate of £1,517,000 submitted by the Westinghouse Electric Corporation for four generators. For the four generators, the British company's estimate was very close to that of the Westinghouse Corporation, who gained the contract, being £1,570,000 compared with £1,517,000.

The English Electric Export & Trading Co. informs us that the transformers will be 103,300 kVA continuously rated single-phase outdoor type power units for connecting in three 310,000 kVA three-phase banks, ratio 230/13·2 kV (one transformer is a spare). The 230 kV winding is designed for star connection (neutral earthed) in the three-phase banks. Each transformer will have an externally operated off-circuit tap changer on the high-voltage winding. They will be forced oil cooled, the oil being cooled by water through a heat exchanger.

Battersea "Lumascope"

One of the features of the Battersea Pleasure Gardens is the "Lumascope," made and installed by the Strand Electric & Engineering Co., Ltd. This consists of lampholders fitted in various designs, containing over 5,000 lamps of various colours. The designs consist of crowns, diamonds, fleurs-de-lis, yellow and green roses, etc., and the control flasher is arranged to exploit not only the combinations of the various

The "Lumascope" installed in the Battersea Pleasure Gardens



lighting groups, but also their sequential interest. The total connected load of this display piece is 80 kW and its size is approximately 120ft by 6ft. The 6,000 yd of cable used for the wiring was manufactured by the Craigpark Electric Cable Co., Ltd., and the lamps used were supplied by the General Electric Co., Ltd., and Crompton Parkinson, Ltd.

Lighting of Coronation State Coaches

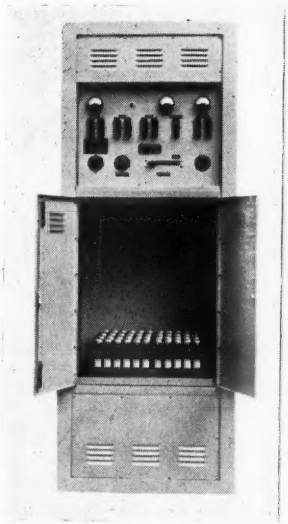
Joseph Lucas, Ltd., and C.A.V., Ltd., through Hooper & Co. (Coachbuilders), Ltd., provided the interior illumination which enabled tens of thousands of people to see the Queen in her Golden State Coach on Coronation Day. The lighting consisted of five 15in fluorescent tubes housed in suitable "Perspex" fittings, two mounted on each side of the coach at the juncture of the roof and side panels, while three in line occupied a similar position over the front glass panel. The light was so arranged that it illuminated Her Majesty's head and shoulders. Electricity was supplied by a 24 V electric battery assembly housed beneath the front seat; the necessary vibrators fitted with suppressors for television anti-interference were enclosed in a sound-proof box. The wiring was carried out in specially selected flexible glass insulated wires and protection for the apparatus and circuits was provided by suitable fuses and safety ensured by the inclusion of a battery isolation switch. The Irish Coach, Glass Coach and Queen Alexandra Coach were also equipped in a similar manner.

History of the E.T.U.

The progress of the Electrical Trades Union since it came into existence sixty-four years ago is recorded in "Story of the E.T.U." an illustrated book of more than 250 pages published by the Union, price 7s 6d. In a foreword the general secretary (Mr. Walter Stevens) explains that the main purpose is to enable members to understand the history of their organization and assist those attending the courses at the Union's college. References are included to additional literature elsewhere.

Switch Tripping Units for Kuwait

The first batch of a consignment of twenty-four "Nife" self-contained switch tripping units has now left this country *en route* to Arabia. They were ordered by His Highness Shaikh Sir Abdulla Al Salim Al Subah of Kuwait through Mr. W. J. D. Addison, his chief electrical engineer, and the consultants (Ewbank & Partners, Ltd.) for the 11 kV distribution scheme now under construction for the Kuwait Government Department of Electricity. The tripping cubicles were specially designed by Nife Batteries. Each unit consists of an angle-iron framework covered by sheet steel, finished in high gloss grey enamel with chromium plated fittings, and divided into two compartments—the upper housing the control and charging gear, and the lower the 50 V battery. Comprising forty-four "Nife" steel alkaline cells, type FA1, with a nominal capacity of 10 Ah, the battery will undertake switch tripping duties up to 100 W and, when necessary, supply an emergency lighting load of 120 W for two hours. The full-wave, bridge connected metal rectifier fitted in the charging circuit and operating from the 240 V 50 c/s single-phase a.c. supply will bring the completely discharged battery back to full capacity within 14 hours. Ventilation difficulties arising from the flush fitting installation were overcome by the provision of louvres and mesh covered apertures in the front cover of each cubicle, and the units are rated for ambient temperatures of up to 50 deg C.



One of the special "Nife" switch tripping units designed for the Kuwait Government

Convention Exhibition

A cross-reference on page 1282 of our 5th June issue to the Robert Maclaren water heater thermostat illustrated on page 1281 unfortunately became misplaced and implied that the instrument was exhibited by the Rheostatic Co., Ltd. The latter company, of course, showed only its own range of manufactures.

"Cheerful Rationing" Ends

The Electrical Association for Women will in future issue the former "Cheerful Rationing" card under the new title of "Electricity at Work." As there is a general easing up of restrictions it was felt that a new title was

necessary, and it was appropriate to make the change with the card for the Coronation month. The first "Cheerful Rationing" card appeared with the beginning of food rationing in November, 1939. "Electricity at Work" will continue to provide monthly information on the contribution of electricity to easier homemaking. The recipes will reflect the wider variety in the foodstuffs available for the British table as well as the increasing range of domestic electrical equipment of varying size and design.

Canadian Trade Fair

In addition to the British exhibitors at the recent Canadian International Trade Fair mentioned in our issue of 29th May, Pearce Signs, Ltd., informs us that it also had a display of its products. A new company, under the title of Pearce Signs (Canada), Ltd., which will be situated in Toronto, Ontario, is being formed to represent the company's interests in Canada.

Plastics Brochure

A comprehensive service for the industrial plastics user is described in an illustrated booklet entitled "The Lorival Plan" issued by Lorival Plastics, of Little Lever, near Bolton. After a brief history of the company the publication takes the reader on a photographic tour of the new factory and includes numerous illustrations of the wide range of Lorival products for the radio, electrical, textile, engineering and other industries.

Laxton's Builders' Price Book

The 1953 edition of Laxton's Builders' Price Book is now available. The whole of the prices in this edition have been revised in the light of present-day conditions and a considerable amount of additional information has been incorporated. The basis upon which the prices are built up is explained in the Preliminary and General Section which also includes data for assessing the value of some of those expenses which vary with the nature of the contract and situation of the site. So far as wages are concerned the prices are based on the rates which came into force in February, 1953. The current rates and gradings for most towns are given with relevant extracts from the London Working Rule Agreement and the latest national schedule of daywork charges, professional scales of fees and charges are included. A useful part of the book containing 272 pages is the list of brands and trade names printed on blue paper for ease of reference and containing over 11,000 items, together with a separate alphabetical list of names and addresses, etc., of firms. The book is published by Kelly's Directories, Ltd., 186, Strand, London, W.C.2, at 30s net.

Broadcasting in the Middle East

A new short-wave broadcasting transmitter which has begun operation at Abu Zaabal, near Cairo, is the most powerful of its kind in the Middle East and is intended as the "voice" of all Arab speaking countries. The transmitter was designed, manufactured and installed by Marconi's Wireless Telegraph Co., Ltd., which erected the first major broadcasting transmitter in Egypt more than twenty years ago and has recently supplied the equipment for the extension of broadcasting in Upper Egypt. The plan to build this 100 kW short-wave transmitter, and a 100 kW medium-wave transmitter with aerial system now under construction by the company at the same site, was originally drawn up some years ago with the intention of giving world-wide and local coverage for the Arabs. In both transmitters the valves are air-cooled. The short-wave transmitter operates on six frequencies and is so designed that rapid selection of any one frequency can be carried out in less than three minutes. Masts for the medium-wave aerial system are 680ft high.

"Open Week" at Helsby Works

During Coronation week more than 2,000 relatives and friends of employees visited the Helsby Works of British Insulated Callender's Cables, Ltd., for the annual "Open Week." Among the visitors were many of the company's former employees who have now retired. The guests toured the various manufacturing departments and saw the production of power capacitors and the many processes involved in the

Visitors in the Braiding Department of the Helsby Works of B.I.C.C. during the recent "Open Week"

manufacture of rubber-insulated and thermoplastic-insulated cables of all types.

New Low-Power B.B.C. Station

The B.B.C. announces that a three-acre site has been acquired at Pages Lane, Bexhill, approximately one mile west of the centre of the town, for the permanent low-power (2 kW) transmitting station that is being provided to improve reception of the Home Service in the area. Construction will start immediately, and when completed the station will take over the service on 206 m (1,457 kc/s) at present given by the temporary transmitter of lower power near Hastings. It is expected that the permanent station with its higher power and better site will extend the area of satisfactory reception to include also St. Leonards, Bexhill and Eastbourne. The permanent station is expected to be in service before the end of the year.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £161 0s 0d
COPPER, H.C. Electro	ton £252 0s 0d
Fire Refined 99·70 per cent ..	ton £251 0s 0d
Fire Refined 99·50 per cent ..	ton £250 0s 0d
COPPER Tubes	lb 2s 6¼d
Sheet	ton £305 10s 0d
H.C. wire and strip	ton £282 15s 0d
LEAD, English	ton £89 5s 0d
Foreign	ton £88 0s 0d
MERCURY	flask £70 10s 0d
TIN	ton £690 0s 0d
ZINC, G.O.B. Foreign	ton £70 5s 0d
Electrolytic	ton £69 15s 0d
BRASS Tubes	lb 1s 11¼d
Sheet	ton £243 0s 0d
Wire	lb 2s 6¼d
PHOSPHOR BRONZE Wire	lb 3s 9¼d
RUBBER, No. 1 R.S.S. spot ..	lb 20⅜d–20¼d

Annual Holidays

The Edinburgh works of Bruce Peebles & Co., Ltd., will be closed for the Edinburgh trades holiday from 3rd to 20th July.

The works and offices of Higgs Motors, Ltd., will be closed from Friday evening, 24th July, until Monday morning, 10th August.

The offices and works of A.B. Metal Products, Ltd., Abercynon, will be closed for the annual holidays from 24th July to 11th August. The London office will be open as usual during this period.

Trade Announcements

A branch has been opened by **Giles Electrical Engineers (Northern), Ltd.**, at 26, Ellison Place, Newcastle-on-Tyne (telephone : Newcastle 27877).

From 24th June the address of the **Strong Electric Corporation (Great Britain), Ltd.**, will be Whyteleafe, Surrey (telephone: Uplands 8822).

Catalogues and Lists

Bulpitt & Sons, Ltd., St. George's Works, Icknield Street, Birmingham, 18.—Four illustrated priced leaflets on electric kettles and percolators (822), domestic appliances (147), immersion heaters (903) and ground base hollowware (217).

Frank Whitelegg, 11, Regent Parade, Sutton, Surrey.—Two illustrated leaflets on strip coil holders and coil taping machines.

Servomex Controls, Ltd., Crowborough Hill, Jarvis Brook, Sussex.—Technical leaflet describing the "Servomex" a.c. voltage stabilizer.

E. N. Mackley & Co., Victoria Works, Gateshead-on-Tyne, 8.—Catalogue illustrating the "Dunelm" circular fluorescent dustproof lighting fittings (M.11).

Benjamin Electric, Ltd., Brantwood Road, Tottenham, London, N.17.—Two leaflets illustrating the range of "Coolicon" plastic shades together with reduced prices list.

Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1.—Priced catalogue presenting the range of "Surflush," "Nearflush" and "Realflush" a.c. switches.

Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1.—20-page booklet, providing in convenient tabular form, technical data on the "Kynal" and "Kynalcore" wrought aluminium alloys.

Gilflex Conduits, Ltd., 41, The Parade, High Street, Watford, Herts.—Leaflet giving details of a new moulded adaptable box (GS.20).

Plysu Products, Woburn Sands, Bletchley, Bucks.—Illustrated booklet dealing with "Plysu" p.v.c. clothing for industry and agriculture.

Abboflex, Ltd., Ferry Road, Teddington, Middx.—Illustrated priced pamphlet relating to "Abcon" conduit coupling and "Abcon-flex" flexible conduit.

Linolite, Ltd., 118, Baker Street, London, W.1.—Leaflet illustrating the new "Linolite" CM.4 pendant fitting and the twin MF fitting.

Millett, Levens (Engravers), Ltd., Whadcoat Street, Finsbury Park, London, N.4.—Illustrated catalogue of nameplates and metal pressings, etc.

Wandleside Cable Works Ltd., 106, Garratt Lane, Wandsworth, London, S.W.18. —Illustrated folder drawing attention to the fact that the company supplied the cable for the Westminster Abbey Coronation lighting.

Aircraft Starting

New Mobile Units for B.O.A.C.

IN present-day aircraft, starting motors for the most powerful engines are required to develop about 100 h.p. Since no mobile ground power units of sufficient capacity were available, Crompton Parkinson, Ltd., and Auto Diesels, Ltd., have collaborated to produce a new unit for service in any climate and conditions throughout the world.

Designed particularly with the requirements of the Comet II and III and Bristol Britannia aircraft in mind, the first of these was recently delivered to the British Overseas Airways Corporation and was demonstrated last week at London Airport to a number of persons interested in military and civil aviation. A large number of these special equipments have already been ordered by B.O.A.C. for installation on selected airfields throughout the world from which the new aircraft will operate.

The new unit consists of a diesel engine driving two generators giving outputs of 450 A continuously at 112 V, and 750 A continuously at 28 V. In addition the unit will supply peak starting currents of 1,000 A at 112 V, and 2,000 A at 28 V. Simultaneous outputs for 28 V servicing and 112 V starting are permissible up to 112 kW. Besides supplying the peak power for engine starting, the unit also provides electrical power for pre-flight servicing and testing. The maximum current output is obtained by using an engine rated to provide for the peak loading conditions without supercharging or speed boosting. In consequence, since there are no abnormal stresses on the engine, it will continue to give reliable service with the minimum of maintenance.

The Leyland engine will provide the maximum generator output on airfields in any climate or any altitude. Batteries included to give 96 V and 24 V respectively are charged from the main generators and provide a source of power for servicing purposes during aircraft refuelling when the diesel engine is shut off. The generators are of the compound wound type specially designed to meet the very exacting requirements, close regulation being achieved without resorting to the use of automatic voltage regulators. Tests have proved that inherent voltage regulation is held even with shock loads of 500 per cent above full load current.

The switchgear comprises two separate sections, one for controlling the 112 V and the other the 28 V outputs. A pushbutton controlled contactor system permits individual selection of any or all supplies, i.e., 24 V and/or 96 V batteries and

Mobile starting and servicing unit in use with a B.O.A.C. "Comet." The control panel is inset

generators can be used in combination and simultaneous 28 V and 112 V outputs with loads up to 100 kW are permissible. The contactors are of the high speed, heavy duty, solenoid operated type. Contactor closure is indicated by panel pilot lamps and also by vehicle roof lamps for air-crew observation.

To ensure fool-proof operation, positive protection is provided against overload, generator over-voltage and reverse current (resulting from feedback from aircraft batteries) by means of a new technique employing sensitive relay instruments and associated high speed main contactor tripping relays. Reverse current tripping operates at minus 2 per cent of full load current. Generator contactors will operate only at voltage in excess of associated battery voltage, and will not operate with reverse generator polarity. All contactors incorporate a "no volt" feature, so that on aircraft plug disconnection automatic tripping will occur without sparking. All fuses are of the replaceable, indicating Edison screw type.

All instruments are of the ...ng circular scale pattern, and have open s...les over the working range so that they ca... be read at a glance from some distance aw... Resilient mountings ensure continued ac...uracy under conditions of shock and vibra...ion. Radio interference suppressors are in...orporated.

Compactness of the power unit has been achieved by using an engine wi... favourable power ratio and close-coupling ...hrough fully-flexible couplings to the gen...rators. The unit, which is mounted on a four-wheeled trailer with a low centre of gravity to provide maximum stability, is enclos... in an all-weather body in keeping with the appearance of present-day aircraft. Accessories include interior lighting, obstruction warning light, static earth, fire-fighting equipment and cable stowage compartments.

Modifications of this unit can be made to meet specific requirements. For example, over-compounded generators may be used to compensate for voltage drop in supply cables to maintain constant voltage at the aircraft terminals, the over-voltage trip being then controlled at aircraft terminals.

"NALGO" CONFERENCE

Conditions of Electricity Staffs

A MEMBERSHIP of more than 32,000 "blackcoated" workers in the electricity supply industry was claimed for the National and Local Government Officers' Association by Mr. L. W. G. Hetherington at the Association's conference at Llandudno last week.

Mr. L. G. Moser, the Association's organizing officer for electricity staffs, outlined the year's achievements and disappointments. He said that they had passed the spectacular stage and having secured reasonable conditions of service they were consolidating and seeking improvements here and there. They had had to resort to arbitration on cost-of-living additions, but with unsatisfactory results. Was that, he wondered, a weakness inherent in arbitration which should make them chary of using it?

The employers had taken a reasonable view over shorthand typists and the staff side had been able to win salary additions for practically all employees with "protected" salaries. The review of the salary agreement itself had been delayed by the "cost-of-living" negotiations and the Boards' attitude was not co-operative. Nor had the staff side been able to get a policy laid down on recruitment and promotion. The management took the view that these were matters for the National Joint Advisory Council and not subjects for negotiation. The Association gave whole-hearted support to the advisory bodies but could not agree that they should usurp functions proper to negotiating councils.

Problems would arise over reo...ganization, said Mr. Moser. They must n... face them in a spirit of antagonism to ...ny change but should make it clear that t...ere was no reason for any redundancy in t... industry;

changes might eventually result in the employment of a smaller number of people, but during the period of reorganization there was no need for anyone to be without a job.

There was considerable debate about the distribution of the hours of duty over the week, based particularly on objections of some staff to working on Saturday afternoons. Mr. Moser made it plain that it was impracticable to deal centrally with the local spread of hours; it must be a matter for local negotiation and settlement.

The desirability of a further salary claim, with the correction of the trend to lower the differentials between grades, was stressed both at the meeting of electricity members and in the general conference. Here two alternative policies were considered: that of the National Executive Council in favour of a survey of salary levels inside and outside "Nalgo's" membership, together with some adjustments here and there, as against a radical attempt to get an immediate all-round increase.

The executive reminded the conference that the rise in the cost-of-living index had now become too small to provide a case for pay improvements. But the president, in his opening address, had provided the alternative suggestion that the claim should be made on the intrinsic value of the jobs done by "Nalgo" members and on the quality of staff required to do them. Delegates who advocated an immediate claim reminded the conference how long it always took to implement any demand and how heavy were the arrears of wage increases over price rises. The conference was convinced and carried the resolution against the National Executive Council.

A plea for the younger staffs in the electricity and gas industries was made in a motion dealing with the voting for local staff committees. At present those under 21 years of age are disfranchised. The conference readily agreed that "immediate steps should be taken to have this matter rectified."

Mr. T. Nolan, accountant of the Leeds Sub-Area of the Yorkshire Electricity Board, was inducted as president of the Association for the ensuing year.

In his presidential address Mr. Watson Strother, borough engineer and surveyor of Bethnal Green, drew attention to the fact that of the total national expenditure of £20,000 million no less than £2,500 million passed through the hands of "Nalgo" members. Yet a fifth of them were getting less than £5 8s a week; nearly three-fifths £5 8s to £11; and one fifth £11 to £20. He suggested that they should seek to make their salary scales more flexible, to speed up promotion into the higher grades so that the good man came quickly to the top, and to increase the incentives for skill and efficiency. In doing so he believed they would have the support not only of the public, their ultimate employers and paymasters, but also of the local authorities and boards who employed them directly. Already there was evidence of concern at the drying up of recruitment to the public service and consequent difficulty of obtaining the skilled and competent men and women needed to run it efficiently. He referred to the completion of the reorganization of the Association, begun in 1946, into five public service groups.

Post Office Engineers

Effects of Capital Restrictions

IN his presidential address to the Post Office Engineering Union's annual conference Mr. L. G. Fox criticized the restrictions on capital expenditure. He said that there was a colossal waiting list of would-be customers, ready and willing to pay their money into the coffers of the Post Office, while at the same time the Post Office surplus was shrinking more and more. A member of the "big five" suppliers of telephone equipment to the Post Office had complained bitterly in its annual report about lack of development and restricted orders.

Mr. Fox said that this lack of expansion had had disastrous results on the promotion prospects of the Union's members, and many of those who had spent endless hours of their private time in studying must be wondering whether the process had been a complete waste of time. The Department had taken full advantage of the operation of the law of supply and demand, and in those cases where there was a good supply of potential material and few vacancies the standard required had been almost unbelievably high. The president added that new entrants to the Department would certainly discover to their cost that the knapsack which was reputed to contain the field-marshal's baton was becoming extremely deep.

ELECTRICITY SUPPLY

Amendment of Moriston Scheme

Rural Supply Costs

THE Secretary of State for Scotland has confirmed an amendment of the North of Scotland Hydro-Electric Board's Moriston project, to economize in scarce materials. The annual output—estimated at approximately 213 million kWh—is not affected. Power will be developed in one stage instead of two, by taking the water direct from the reservoir at Dundreggan to an underground generating station nearby which will discharge into a tunnel leading to Invermoriston. A subsidiary station which was to have been built near the Livishie dam will, under the amending scheme, be built near the Dundreggan dam. The estimated capital cost of the scheme, as amended, is £13 million.

The statutory Amenity Committee has made no observations on the scheme but may later make recommendations on such matters as the concealment of pipelines, etc., the siting of spoil dumps and the design of structures to be erected under the scheme. While the Board's proposals for compensation water do not meet the Fisheries Committee's recommendations in full, the Secretary of State is satisfied that the Board has made reasonable provision for the preservation of fish.

Generation in May

In the first five months of this year there has been an increase of 5·9 per cent in electricity generated by the British Electricity Authority and the North of Scotland Hydro-Electric Board, and this was precisely the rate of expansion in May itself. At the end of the month the total capacity of plant installed was 17,742 MW compared with 17,709 MW a month before.

During May four additional boilers were installed in B.E.A. stations—a 300,000 lb/hr Babcock & Wilcox unit at Bromborough, two 180,000 lb/hr John Thompson boilers at East Yelland and one 230,000 lb/hr International Combustion unit at Nechells "B." A 32 MW Richardsons Westgarth generating set was installed at Rye House power station.

High Steam Conditions

It is reported in *Electrical World* that the American Gas & Electric Co. is to install in its Philo plant a 120,000 kW generating unit which will utilize an initial steam pressure of 4,500 lb/sq in and a temperature of 1,150 deg F. These are higher than in any unit yet designed.

Power Station Inquiry

When the public inquiry continued at Burton-on-Trent into objections to the proposal to establish a generating station at Willington, the headmaster of Repton School, Mr. T. L. Thomas, said that at the moment Repton was a kind of oasis amid the industrial districts of Burton, Swadlincote and Derby. Few things

ELECTRICITY GENERATED AND PLANT INSTALLED

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total*		
British Electricity Authority ..	2,620	65	4·1	4,740	14	4,760	4,[illegible]	17,183
North of Scotland Board ..	22	—	1·3	30	61	96		559
Total for May, 1953	2,642	65	5·4	4,770	75	4,856	4,5[illegible]	17,742
Corresponding total for May, 1952	2,543	67	3·9	4,503	71	4,584	4,2[illegible]	16,532
Increase or decrease, per cent ..	+3·9	−3·0	+38·5	+5·9	+5·6	+5·9	+[illegible]	+7·3
Total to date (5 months) ..	15,608	409	35·5	28,000	458	28,528	26,[illegible]	
Total for corresponding months of 1952	14,994	355	30·6	26,270	600	26,939	25,[illegible]	
Increase or decrease, per cent ..	+4·1	+15·2	+16·0	+6·6	−23·7	+5·9	+[illegible]	

* The total figure includes 7·1 million kWh generated by oil engines and 4·4 million by waste heat plants [illegible]ay, 1953.

were likely to damage the school more than a general industrialization of the district, of which the proposal to establish a power station was a beginning. Mr. F. D. R. Monro, a governor of Repton School, said that a power station at Willington could have a disastrous effect on the school.

Mr. Eric Blain presented Derby Corporation's objection, which was that with 420ft chimneys at Willington the operation of Derby Airport would be interfered with. Mr. Blain asked the Ministry to limit the chimneys to a maximum of 340ft and also to ensure that there should be no overhead lines within a mile of the airport. If there were, the airport would lose its licence.

Mr. G. O. Willgoose, secretary of the Derby Branch of the National Farmers' Union, who represented farmers in the vicinity of the proposed power station, contended that deposits of grit and the fumes from the chimneys would reduce the value of the land.

Cost of Supplying Farms

An official of the North Eastern Electricity Board, Mr. J. M. Smillie, has visited Minister-acres (Northumberland) to explain to local farmers why it cost so much to connect their farms. Mr. Smillie pointed out that it would cost the Board £26,000 to take electricity to the district before a single consumer was connected. The Board felt that it could not therefore contribute further to the cost of connecting the individual farms. Few farm electricity schemes were self-supporting as the amount of electricity used was small compared with the capital cost of providing the supply. Mr. F. C. Batey, a farmer who has been in conflict recently with the Board over a charge of £650 required to supply his farm, said that the electricity authority had for 30 years neglected rural districts to "scoop the cream off" the more populous areas. The General Post Office would erect poles to carry the telephone to only one consumer without charge. He also alleged that charges for supplying farms were higher in the North Eastern Area than in other parts of the country.

Ulster Scheme Approved

The proposal to construct a dam and erect a hydro-electric generating station on the River Bann at Carnoe, near Kilrea, has now been approved by the Northern Ireland Ministry of Commerce. The scheme provides for the connection of the station with existing power sources and the existing transmission network.

H.V. Cable in Gardens

Jarrow-on-Tyne Town Council is objecting to a proposal by the North Eastern Electricity Board to lay a cable through the gardens of council houses on the Leam Lane estate to Boldon substation. The Council contends that it would be dangerous to have a high voltage cable, protected only by tiles, laid in gardens less than 3ft from the surface. The Electricity Board says it would cost another £500 to use an alternative route.

Confederation Building, Ottawa, floodlit by the British General Electric Co. (Canadian), Ltd., with fittings made in England

New Street Lanterns

Over thirty of the new type B.T.H. 5ft fluorescent street lighting lanterns exhibited to the public for the first time at this year's B.I.F. have been installed in Eltham High Street. Each lantern houses three 80 W lamps and has a corrosion resistant aluminium canopy to which is fitted a smooth one-piece "Perspex" cover bowl entirely free from drilling and riveting. The columns were erected by Harland & Wolff, Ltd., the contractors for the mounting of the lanterns and the wiring being the London Electricity Board.

The first installation of the new B.T.H. 5ft fluorescent street lighting lanterns at Eltham

Financial Section

STOCKS and SHARES

MOST sections of the Stock Exchange continue quietly to mark time, awaiting the final outcome of the Korea negotiations, and the further unfolding of events in the international scene. Gilt-edged stocks became hesitant on the rumour (since confirmed) that the recent strength of the market might be taken as the opportunity for launching a really large-scale Government loan. Industrials were not helped by some of the current company news, containing references by several of the engineering companies to keener competition for new orders. In a general sense, however, the further improvement in the latest figures for the gold reserves, industrial production and employment, assisted in the maintenance of a reasonably firm front. British Electric Traction deferred stock rose 20 points, to 550, on the increase in the dividend to a total of 35 per cent. Telephone Properties at 95s are 5s lower on a falling-off of interest in the shares.

W. H. Allen Results

The final dividend and preliminary profits statement published last week by W. H. Allen, Sons & Co. are the first to appear since the marketing of the £1 ordinary shares last autumn. The total distribution of 15 per cent for the year corresponds with the rate forecast in the statement advertised at that time, while the profit of £648,000 comes out substantially above the level then estimated. Increased taxation is responsible for some reduction in the net surplus, but the distribution is clearly well on the conservative side. The present quotation of 46s 3d is some 5s above the price at which the shares were originally introduced; it provides a yield of 6½ per cent from the latest rate of dividend.

New Issues

Laurence, Scott & Electromotors new 5s "A" ordinary shares have been changing hands at a premium of around 7s 6d on the price of 5s at which they were offered to shareholders. Payment is due on 29th June, and allotments will be renounceable until the middle of July. Until then, the new shares will be available free of the usual 2 per cent transfer stamp duty on a purchase. At an all-in price of 12s 6d, the prospective yield is 6 per cent, assuming repetition of the dividend at the latest rate of 15 per cent. The payment for last year was covered fully five times over by the earnings available. R. B. Pullin's new 2s shares, offered to shareholders at 2s 6d, opened at a premium of about 4½d. This company also paid a well covered 15 per cent dividend last time, and the indicated yield to a buyer is approximately 10 per cent. The new shares will be transferable free of stamp duty until the 25th of this month.

Chloride Electrical

Chloride Electrical Storage "A" shares have held their ground lately at a little over 70s, which is within a shilling or two of the year's best price. They show a yield of 5·6 per cent from the 20 per cent distribution paid for 1952. The latter was raised, from the previous year's 15 per cent, by the addition of a 5 per cent bonus, and although net profits for the period were about half a million lower than before, they still cover the larger payment more than 2½ times. Sales of the group expanded materially last year, and it was made plain at the annual meeting, held early in this month, that the drop in the price of lead was the main factor in reducing earnings. The balance sheet includes a reserve of over £2 million against such a contingency, and it is one mark of the group's financial strength that this fund is being left intact for the present.

A.E.I. New Shares

Payment in full was due yesterday (Thursday) for the "repatriated" ordinary shares offered at 75s to present stockholders of Associated Electrical Industries. Previously, the selling of "rights" by stockholders unable or unwilling to subscribe for their allotments, had prevented the materialization of anything more than a few pence, at best, in the way of a premium on the issue price. With this influence removed, and the shares settling by degrees into firm hands, a hardening of the quotation would not, in the ordinary course of events, be considered surprising. It is recalled that the price of the old shares has been marked down by about 5s since the first announcement of this addition of over two million shares to the market supply. The price was standing at over £4 earlier in the year.

Brush Electrical

At last month's annual meeting of the Brush Electrical Engineering Co. the chairman confirmed the impression that of the two main sides of the business, the older-established one of electrical engineering had the more satisfactory year in 1952. Certain setbacks occurred in the

diesel engine business, which has grown to be the larger part of the organization, and it was already known from the annual report that an exceptional loss on Indian contracts for tube-wells was largely responsible for the omission of the usual final dividend. This would have been comfortably provided for out of the net earnings under normal activities. In the circumstances, the market was particularly interested in the managing director's indication that future policy is to put a larger emphasis on the group's electrical products. The price of the company's 5s shares has shown little change lately at around 3s 3d.

Company	Dividend Previous	Dividend Last	Middle Price 15th June 1953	Week's Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks					£ s d
Brit. Elec. 1968/73	3	3	88	—	3 8 2
Brit. Elec. 1974/77	3	3	87	—	3 9 0
Brit. Elec. 1976/79	3½	3½	92½	+½	3 15 9
Brit. Elec. 1974/79	4½	4½	100½	−½	4 4 7
Calcutta Elec. ..	6†	6†	20/6	—	5 17 0†
East African Power	7	7	21/6	—	6 10 2
Nigerian Elec. ..	10	10	22/6	—	8 18 0
Palestine Elec."A"	5†	Nil	12/6	—	—
Perak Hydro-Elec.	Nil	Nil	15/-	—	Nil
Equipment and Manufacturing					
AberdareCables(5/-)	20	25	16/-	—	7 16 4
Aerialite (1/-) ..	83½	88½	8/9	—	10 1 10
Allen, W. H. ..	15	15	46/3	—	6 9 9
Aron Elec. Ord. ..	15	15	38/9	—	7 14 10
Assoc. Elec. Ord. ..	20	20	73/9	—	5 8 6
Automatic Tel. & El.	15	15	58/9	—	5 2 3
Babcock & Wilcox	18	18	63/3	—	5 13 9
Baldwin, H. J. (2/-)	25	20	3/9	—	10 13 4
Bakelite (10/-) ..	—	12½	17/-	—	7 7 0
British Aluminium	12	12	38/-	−6d	6 6 4
B.I. Callender's ..	9	10	36/-	—	5 11 0
British Thermostat (5/-)	30	35	30/-	—	5 16 8
British Vac. Cleaner (5/-)	25	25	12/3	—	10 4 2
Brook Motors (10/-)	20	20	32/6	—	6 3 1
Brush Ord. (5/-) ..	10	4	3/3	—	—
A. F. Bulgin (1/-) ..	30	30	2/9	—	10 18 0
Burco (5/-) ..	38¾	35	17/6	—	10 0 0
Chloride El. Storage	15	20	71/-	—	5 12 6
Cole, E. K. (5/-) ..	25	25*	18/-	+1/-	—
Cosser, A. C. (5/-) ..	Nil	10	8/9	—	5 14 3
Crabtree (10/-) ..	17½	17½	30/-	—	5 16 8
Crompton Parkinson Ord. (5/-) ..	11½	11½	10/-	—	5 12 6
De La Rue (5/-) ..	50	35*	7/-	−6d	—
Decca (5/-) ..	112½	150	25/6	−9d	5 17 8*
Dewhurst (2/-) ..	22½	19*	5/6	—	6 18 3
Dictograph Tel. (2/-)	20	20	5/6	—	7 5 6
E.M.I. (10/-) ..	12	12	13/3	—	9 1 2
Electrical Components (5/-) ..	20	20	10/-	—	10 0 0
Elec. Construction	15	15	53/9	—	5 11 6
Enfield Cable Ord.	7½	5	20/6	+6d	4 17 6
English Electric ..	15	15	56/-	—	5 7 2
Ericsson Tel. (5/-)	22†	22*†	37/6	—	2 18 9†
Ever Ready (5/-)	35	35	26/-	—	6 14 8
Falk Stadelmann ..	15	15	42/3	—	7 2 0
G.E.C. Ord. ..	22½	22½	40/9	—	5 10 5*
General Cables (5/-)	30	30	16/3	+	9 4 8
Greenwood & Batley	15	15	40/-	—	7 10 0
Hackbridge Cable (5/-)	20	20	12/-	—	8 6 8
Hackbridge Hewittic (5/-) ..	18	20	17/-	—	5 17 8
Hall Tel. Acc. (10/-)	10	10	10/-	—	10 0 0
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (10/-) ..	20	10½*	16/9	−3d	6 5 6
Holophane (5/-) ..	15	20*	12/6	—	8 0 0
Hoover (5/-) ..	35	25	22/-	—	5 13 8

Company	Dividend Previous	Dividend Last	Middle Price 15th June 1953	Week's Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)					£ s d
Intl. Combustion (5/-)	25	15*	11/-	+6d	5 7 3
Johnson & Phillips	15	15	50/6	—	5 19 6
Lancashire Dynamo	12½	12½*	41/3	—	6 1 0
Laurence, Scott (5/-)	15	15	12/3	+6d	6 2 6
London Elec. Wire	12½	15	55/-	—	5 9 0
J. Lucas	7½	9½	37/6	—	4 17 9
Marryat & S. (2/-)	22½	22½	5/9	—	7 16 6
Mather & Platt ..	12½	15	48/-	+6d	6 5 0
Metal Industries ..	10	15	43/3	+3d	—
Mid. Elec. Mfg. ..	15	15	59/6	—	5 0 10
Murex	12½	15	56/3	+⅛	5 6 9
Newman Ind. (2/-)	10	10	2/3	—	8 17 9
Oldham & Son (1/-)	30	35	2/6	—	—
Parnall (Yate) (5/-)	6	6	2/9	—	10 18 2
Parsons, C. A. ..	10*	12½	65/-	—	3 17 0
Plessey (5/-) ..	22½	25	22/6	—	5 11 1
Pye Deferred (5/-)	18	18	19/-	+3d	4 14 9
Revo (10/-) ..	27½	27½	46/-	—	5 19 7
Reyrolle	10*	12½	55/-	—	4 11 0
Scot. Cable (4/-) ..	30	32	11/9	—	—
Siemens Ord. ..	10	10	34/-	—	5 17 8
Southern Areas ..	5	6	13/9	—	8 14 6
Strand Elec. (5/-) ..	17½	17½	10/-	—	8 15 0
Sturtevant (5/-) ..	17½†	18·1*†24/-		+6d	3 15 0†
Switchgear&Cowans (5/-)	22½	22½	14/-	−9d	8 0 9
Taylor T. (5/-) ..	20	25	20/-	—	6 5 0
T.C.C. (10/-) ..	20	20*	41/3	—	4 17 0
T.C. & M.	10	8½*	27/6	+6d	6 3 8
Telephone Mfg.(5/-)	10	10	8/3	—	6 1 3
Thorn. Elec. (5/-) ..	10	12½	10/9	+3d	5 16 4
Tube Investments	25	15*	56/-	—	5 7 8
Vactric (5/-) ..	Nil	Nil	5/-	—	Nil
Veritys (5/-) ..	7½	10	5/-	—	10 0 0
Walsall Conduits (4/-)	70	70	46/-	—	—
Ward & Goldstone (5/-)	45	45*	39/6	−1/-	—
Watford (2/-) ..	25	25	6/9	—	7 8 2
Westinghouse Brake	14	15	52/-	—	5 15 5
West, Allen (5/-) ..	15	15	11/3	—	6 13 4
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord.	—	6	85½	−2	7 0 3
Ord.	—	3¾	57½	—	6 10 5
Anglo-Portuguese	8	8	21/6	+6d	7 8 10
Brit. Elec. Traction: Def. Ord. ..	25	35	550	+20	6 7 3
Cable & Wireless: Ord.	8	8	135	−1	5 18 6
4% Loan ..	4	4	95½	—	4 3 7
Calcutta Trams ..	6†	6†	23/6	—	5 2 2†
Cape Elec. Trams	5	5½	12/-	—	9 3 4
Marconi Marine ..	10	10	30/-	—	6 13 4
Oriental Tel. Ord.	16	16	70/-	—	—
Telephone Props. ..	8	8	95/-	−5/-	—
Tele. Rentals (5/-)	10	10*	8/6	+3d	—

* After capital bonus. † Dividends are paid free of income tax.

The above quotations are based upon the middle prices given in the Stock Exchange Daily Official List.

REPORTS and DIVIDENDS

Heatrae, Ltd., reports a trading profit for the year ended 28th February last of £38,400, as compared with £46,022 for the preceding year. After meeting all charges, including £11,500 for taxation, there is a net profit of £11,464 (against £15,737). The dividend for the year is unchanged at 12½ per cent and the balance carried forward is £23,769 (against £21,530 brought in).

In his circulated statement, Mr. C. H. Smith (chairman) says that the reduction in the net profit is due entirely to the falling off of orders for electric water heaters, brought about by the continued imposition of a penal purchase tax. The position, however, is now somewhat improved because of the partial relief announced in the Budget. There has been a substantial increase in overseas sales of electric water heaters and in home sales of products on which purchase tax is not levied. Business in the industrial field has continued to improve, noteworthy examples being the oil heating and air heating divisions. The agricultural section is now supplying food boilers and water heaters for use on farms. Contracts are in hand for hospital sterilizer equipment and portable food trolleys, and Government contracts include hot cupboards, water heaters and immersion heaters. The sale of electric fires should increase now that the purchase tax rate has been reduced. In view of the substantial volume of orders now in hand, the results for the current year can be viewed with optimism.

Venner, Ltd.—In his statement, which has been circulated with the report and accounts, Mr. A. A. Rowse (chairman) says that the output in the year under review constituted a new record. The new building extensions have been completed and they are fully occupied with engineering work of a confidential nature. The demand for time switches has been well maintained, and they have been well received overseas, particularly in Australia where import restrictions have now eased. The major part of the flashing beacons on zebra crossings installed throughout the country are being furnished by Venner's. The accumulator has made considerable progress during the year and, despite heavy development charges, has made a small contribution to the profit. In the field of electronic development covered by their subsidiary, Venner Electronics, Ltd., good headway has been made. Electronic aids for the whaling industry have been developed, together with transmitting equipment for safety at sea, and experimental work in the field of remote switching by radio frequency is receiving attention. They have concluded an agreement with American interests for the exclusive right to manufacture and sell in this country and the world, excluding the American continent, one of the best known parking meters in the United States.

George Kent, Ltd., are holding an extraordinary meeting on 30th June at which resolutions will be submitted for increasing the authorized ordinary capital from £400,000 to £550,000. The directors state that the capital expenditure over the next two or three years is likely to amount to £525,000. It is anticipated that half this sum can be financed out of retained profits, the balance coming from a "rights" issue to ordinary shareholders.

W. H. Allen, Sons & Co., Ltd., announce that after a special charge in respect of past-service pensions of £60,687, the profit for 1952, before taxation, is £647,965, as compared with £638,515 for 1951. Taxation absorbs £370,000, and the net profit is £277,965 (against £318,515). Reserves receive £190,798, and it is proposed to pay a final dividend of 10 per cent on £1,021,875 capital, making 15 per cent for the year. A similar dividend was paid in the previous year on £408,750 capital existing before the 150 per cent scrip issue.

Worthington-Simpson, Ltd., show a trading profit for 1952 of £691,715, against £593,954 for 1951, and a net profit, after taxation, of £239,603 (against £217,363). The dividend for the year is unchanged at 20 per cent, but is paid on larger capital. The balance carried forward is £179,512 (against £152,780 brought in).

Pye (Ireland), Ltd., has announced a final dividend of 7½ per cent and a bonus of 4 per cent, making 14 per cent for the year (unchanged).

Holophane, Ltd., has declared an interim of 7½ per cent (unchanged).

Liquidations

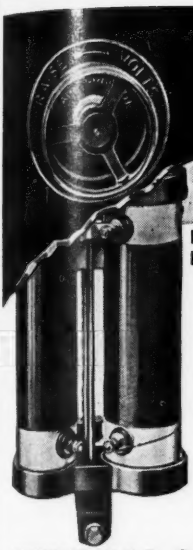
Electronics (Liversedge), Ltd.—Winding up voluntarily. Liquidator, Mr. W. Dargue, Atlas Chambers, King Street, Leeds, 1.

Wellgale Electrical Co., Ltd.—In voluntary liquidation. Meetings of members and creditors on 27th July at the offices of W. H. Cork, Gully & Co., 19, Eastcheap, London, E.C.3, to receive an account of the winding-up by the liquidator, Mr. K. R. Cork.

Bankruptcies

D. L. Smith, residing at 9, Kensington Road, Coventry, lately carrying on business at Midland Bank Chambers, Cefn Road, Old Colwyn, Denbighshire, electrical engineer.—First and final dividend of 2s 6d in the £, payable on and after 1st July at 2, Rumford Place, Liverpool, 3.

Precision Control



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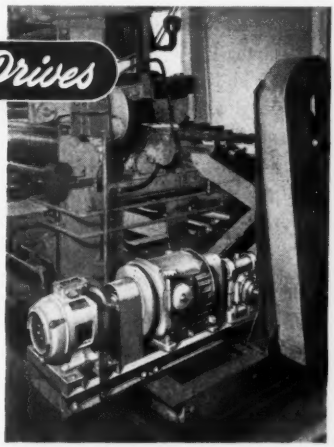

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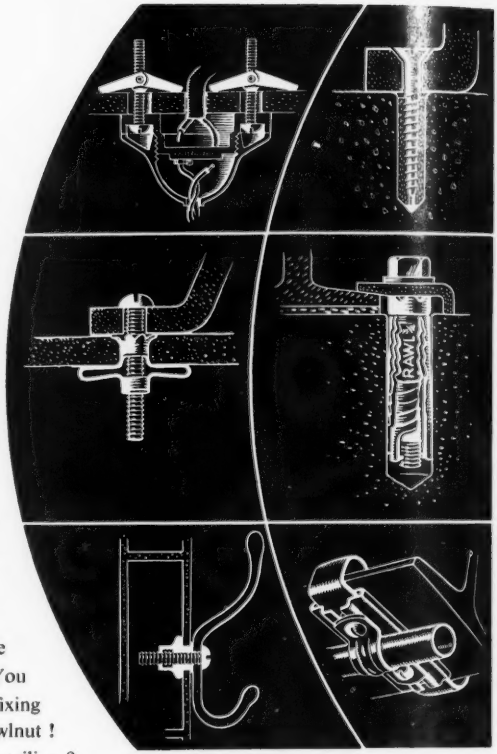

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 29th July from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

21338. Postmaster General.—Apparatus for controlling the frequency of a mechanically oscillatory member. 25th April, 1951. (694774.)

24268. Koch, R. F.—Single button tuning control for radio sets. 21st September, 1949. (694775.)

25691. Parsons & Co., Ltd., C. A., and Martin, A. E.—Infra-red gas analysing apparatus. 17th August, 1950. Addition to 642750. (694777.)

29787. Barrett, E. L.—Dynamo-electric machine. 21st November, 1949. Convention date not granted. (694718.)

1950

860. Companhia Portuguesa Radio Marconi.—Electrical multi-channel impulse communication system with in-constant impulse repetition frequency. 12th January, 1950. (694951.)

2507. British Thomson-Houston Co., Ltd.—Flexible cupreous articles. 31st January, 1950. (694952.)

2633. British Thomson-Houston Co., Ltd.—Expansion joints for metal coverings. 1st February, 1950. (694953.

3876. Svenska Aktiebolaget Gasaccumulator.—Radio means for locating the direction and distance between two objects. 15th February, 1950. (694721.)

5327. Fairey Aviation Co., Ltd.—Electric terminal blocks. 2nd March, 1951. (694724.)

6816. S.E.G.I. Soc. Elettrotecnica Chimica Italiana, and Caregallo, G.—Self-centering and seal bearings for electrical devices. 20th March, 1950. (694859.)

11260. Electric & Musical Industries, Ltd.—Pulse generating apparatus especially for television and like transmitters. 7th May, 1951. (694725.)

13303. Siemens Bros. & Co., Ltd., and Yates, K. R.—Telephone systems. 25th May, 1951. (694726.)

13642. Metropolitan-Vickers Electrical Co., Ltd.—Electrical impedance relays. 17th May, 1951. (694785.)

13844. Johnson & Phillips, Ltd., and Hollingsworth, P. M.—Electric cables. 31st August, 1951. (694862.)

14459. Johnson & Phillips, Ltd., Wooldridge, J., and Raine, P. A.—Metal-sheathed electric cables. 27th August, 1951. (694863.)

14664. Automatic Electric Laboratories, Inc.—Automatic telephone systems. 12th June, 1950. (694787.)

14811. Cropper, F. W.—Electric lighting fittings. 6th September, 1951. (694788.)

16908. McMurdo Instrument Co., Ltd., and Hallan, R. T.—Retaining device for thermionic valves and the like. 5th October, 1951. (694729.)

18104. Power-Gas Corporation, Ltd., and Wright, G.—Electrical apparatus for controlling cyclic operation of multi-unit apparatus. 20th July, 1951. (694792.)

21220. English Electric Co., Ltd.—Gyroscopes. 24th August, 1951. (694867.)

22086. Johnson & Phillips, Ltd., and Raine, P. A.—Metal-sheathed electric cables. 27th November, 1951. (694969.)

23479. Marconi's Wireless Telegraph Co., Ltd.—Radar systems. 10th August, 1951. (694736.)

23770. Electricité de France.—Method of and apparatus for measuring and controlling a liquid level. 28th September, 1950. (694737.)

24239. Hobart Manufacturing Co.—Dishwashers. 4th October, 1951. (694869.)

24767. Staatsbedrijf der Posterijen Telegrafie en Telefonie.—Line-terminating circuit. 10th October, 1950. (694972.)

27277. English Electric Co., Ltd.—Resilient wheels. 8th November, 1951. (694877.)

28191. Standard Telephones & Cables, Ltd.—Credit sanction systems. 16th November, 1951. (694798.)

28794. Smart & Brown (Engineers), Ltd.—Fittings for electric lamps. 26th November, 1951. (694800.)

28979. General Electric Co., Ltd., and Bloch, A.—Alternating current bridges. 27th November, 1951. (694801.)

28980. General Electric Co., Ltd., and Thompson, G. T.—Methods of measuring electrical impedances. 27th November, 1951. (694802.)

29113. I-T-E Circuit Breaker Co.—Rectangularized television tube body. 28th November, 1950. (694977.)

30531. British Thomson-Houston Co., Ltd.—Electric arc furnace control systems. 9th October, 1951. (694745.)

1951

36. Ireland, J.—Electrodeposition of tin-cobalt alloys. 7th December, 1951. (694811.)

635. General Electric Co., Ltd., and Hubbold, S.—Electric lighting fittings. 11th December, 1951. (694984.)

659. Oldham & Son, Ltd., and Morton, H.—Electric rotary switches. 14th December, 1951. (694885.)

1400. British Thomson-Houston Co., Ltd.—Electrical bushings. 18th January, 1951. (694813.)

1852. General Electric Co., Antrich, D., and Bryden, J. E.—Apparatus for indicating phase relationship between electrical quantities. 18th January, 1952. (694887.)

2141. Hollander, J. M.—Electric power distribution system. 23rd January, 1952. (694751.)

2919. British Insulated Callender's Cables, Ltd.—Means for examining the surface of an insulated wire or like article. 5th February, 1952. (694889.)

3946. Wilmot-Breeden, Ltd.—Copper electrodeposition. 7th December, 1951. (694893.)

6544. Carr Fastener Co., Ltd.—Electrical adaptors. 18th January, 1952. (694985.)

6688. British Insulated Callender's Cables, Ltd.—Electric cables. 19th March, 1952. (694986.)

7711. General Electric Co., Ltd.—Dry plate rectifier assemblies. 24th March, 1952. (694755.)

7994. Wardle Engineering Co., Ltd., and Ogley, D. H.—Reflector fittings for electric lamps. 3rd April, 1952. (694902.)

8395. Brush Development Co.—Process for making transducer devices having bonded elements. 11th April, 1951. (694987.)

9180. British Thomson-Houston Co., Ltd.—Voltage regulators. 19th April, 1951. (694756.)

9940. General Electric Co., Ltd., and Field, R. W. G.—Systems of electrical remote indication. 12th February, 1952. (694907.)

9976. Siemens Bros. & Co., Ltd.—Electric apparatus components, such as electric condensers, having hermetically-sealed metal cases. 25th April, 1952. (694758.)

11074. Marconi's Wireless Telegraph Co., Ltd.—Send-receive control circuits for radio telephone stations. 24th January, 1952. (694991.)

11444. British Thomson-Houston Co., Ltd.—Bearing structures for rotating machines. 16th May, 1951. (694910.)

12514. Soc. d'Exploitation de Brevets.—Dynamo-electric machines. 28th May, 1951. (694993.)

13222. Automatic Electric Laboratories, Inc.—Automatic exchange systems. 4th June, 1951. (694915.)

14222. Western Electric Co., Inc.—Electrical capacitors and methods of making same. 15th June, 1951. (694995.)

14681. Siemens-Schuckertwerke Akt.-Ges.—Circuit arrangements for Ward-Leonard sets. 20th June, 1951. (694830.)

16324. British Thomson-Houston Co., Ltd.—Combined shut-off and throttle valve assemblies. 10th July, 1951. (694919.)

21157. Western Electric Co., Inc.—Electrical circuit regulating device. 7th September, 1951. (694999.)

21390. I-T-E Circuit Breaker Co.—Process for making a rectangularized television tube body. 28th November, 1950. Divided out of 694977. (695000.)

21447. Pischel, W.—Balancing machines with electrical indicating devices. 12th September, 1951. (694834.)

21775. Philips Electrical Industries, Ltd.—Circuit arrangements in which a signal is supplied to a control device. 17th September, 1951. (694835.)

24038. Modern Telephones (Great Britain), Ltd., and Adler, A. E.—Intercommunication telephone systems. 15th October, 1951. (694928.)

24789. Babcock & Wilcox, Ltd.—De-superheaters. 23rd October, 1951. (694930.)

26180. Svenska Aktiebolaget Gasaccumulator.—Tuning devices more especially for use at very high frequencies. 8th November, 1951. (694838.)

30239. Machines Automatiques Bouchet, Honore, E. A. H., Torcheux, E. L. G., and Roy, R. . C.—Variable condensers. 27th December, 1951. (694[illegible]2.)

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896. Standard Telephones & Cables, Ltd.—Contact arrangement for the electron tubes of high-frequency apparatus. 11th January, 1952. (694844.)

2440. Compagnie Générale de Télégraphie sans Fil.—Tubular condenser assemblies. 29th January, 1952. (694846.)

2727. International Research & Development Corporation.—Combined magnetic transducer head and coupling transformer. 1st February, 1952. (695005.)

3380. Standard Telephones & Cables, Ltd.—Tone wheel to produce frequency-modulated low-frequency oscillations. 8th February, 1952. (694937.)

7993. Philips Electrical Industries, Ltd.—Methods of sealing together two large glass objects, more particularly the glass cone and the glass window of a cathode-ray tube. 28th March, 1952. (694849.)

10421. Electric Furnace Products Co., Ltd.—Electric reduction furnace. 25th April, 1952. (694910.)

In the Courts

PURCHASES of steel at prices varying between £8 and £16 per ton above the permitted maximum were made by the English Electric Co., Ltd., it was alleged at Stafford magistrates' court on 10th June. This company and Thomas Frederick Turner, chief steel buyer at Stafford, were summoned on five counts for buying a total of 57 tons 16 cwt of steel at prices above the permitted maximum from J. Byrne of Newcastle, Staffs, and on another five counts for buying a total of 144 tons 9 cwt from De Jersey & Co. (Finland), Ltd., at prices above the maximum. De Jersey & Co. were summoned for selling the steel at excessive prices to the English Electric Co., and for buying steel from Ralph Charles Michaelson, of Portman Mansions, Chiltern Street, London. Michaelson was summoned for selling steel at excessive prices to De Jersey & Co.

Mr. L. G. Hill, an investigating officer of the Ministry of Supply, said he saw Mr. Turner at the Stafford offices of the English Electric Co. and asked him about purchases of steel from De Jersey & Co. Mr. Turner said the steel was fabricated. Visiting the London offices of the English Electric Co., Mr. Hill was told the managing director was most angry that there should be any allegation of contraventions of the Prices Control Order. He was unable to understand why his buying office had resorted to strange buying methods for such comparatively small quantities of steel.

When Mr. Turner was called in at the London interview he said that on each of the transactions with De Jersey & Co. there were two orders and two invoices. One of each was for steel at the controlled price, and the other order and invoice for fabrication to cover the excess price paid. No fabrication was in fact required. In a statement alleged to have been made by Mr. Turner, it was stressed that in no case had he bought material to which his company was not entitled under the rationing scheme. But for these purchases, export contracts and essential home requirements would have been delayed.

All the cases were sent by the magistrates for trial at the Staffordshire Assizes.

Fatal Shock through Leaf

At Norfolk Assizes on 5th June it was stated that the Eastern Electricity Board had agreed to pay a total of £2,250 damages to the widow and son of a cable jointer who met his death as the result of an accident in July, 1951.

Mr. Martin Jukes, for Mrs. Forsdyke, explained that the Board was making a test and the insulation was taken from some wires. Mr. Forsdyke was helping to dig up a cable under the direction of an assistant engineer, and when the test was not successful, they consulted together. Then, due to an "extraordinary situation," Mr. Forsdyke leant forward, holding a wet dandelion leaf, to point to where he thought the fault was. A spark ran up his arm and gave him an electric shock from which he died.

The Eastern Electricity Board has contended that the accident was partly the fault of Mr. Forsdyke. This, and the fact that he left his wife an estate of £981, had been taken into consideration in fixing the damages.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Anglesey.—Education Committee. Electrical installation at new primary school, Holyhead. (See this issue.)

Australia.—MELBOURNE.—1st July. State Electricity Commission of Victoria. Supply of 200 kV potential transformers. (C.R.E. 19773/53. Ten/6581.)*

BRISBANE.—29th July. Queensland State Electricity Commission. One 175 kW alternator for Longreach Shire Council.

Belfast.—29th June. Ministry of Finance. Electrical installation at the Faculty of Agriculture building, Queen's University, Elmwood Avenue. Ministry Room No. 103, Law Courts Building, May Street.

Brazil.—PORTO ALEGRE.—25th August. Rio Grande do Sul State Energy Commission. Mechanical and electrical equipment for the Ernestina hydro-electric power station. (C.R.E. 19264/53. Ten/6553.)*

Bromley.—13th July. Town Council. Street lighting improvements. (See this issue.)

Rewiring County Technical School for Girls. (See this issue.)

Carlisle.—24th June. Cumberland River Board. Additional lighting at the Board's headquarters in London Road, Carlisle. Chief engineer.

Ecuador.—AMBATO.—24th July. Municipality. Electrical equipment and hydro-electric machinery for the "Rio Verde" plant. (C.R.E. 19935/53. Ten/6595.)*

Glasgow.—26th June. Corporation. Supply of 100,000 yds of p.v.c. aerial cable. (See this issue.)

Glendale (Northumberland).—4th July. Rural District Council. Electric wiring of 16 houses at Lambton Avenue, Lowick. Surveyor, Council Offices, Wooler.

India.—AHMEDABAD.—30th June. City Engineer. Supply of 200 kVA, 250 kVA, 750 kVA and 1,000 kVA transformers, and h.v. oil circuit breakers. (C.R.E. 19122/53. Ten/6576.)*

MADRAS.—4th August. Government of Madras Electricity Department. Outdoor and indoor switchgear equipment for the substation covered by the Salem-Namakkil 110 kV extensions. (C.R.E. 19705/53. Ten/6582.)*

Lichfield.—4th July. Sutton Coldfield and Tamworth Hospital Management Committee. Electric lamps and fluorescent tubes for various hospitals. Secretary, 15, Trent Valley Road.

Litherland.—29th June. U.D.C. Lanterns, lamps, control gear and columns for Class A lighting in Bridge Road. Surveyor, Town Hall.

Longbenton.—11th July. U.D.C. Electrical installations in houses. (See this issue.)

Middlesbrough. — Education Committee. Installation of electric lighting and power at the Marsh Road Schools. P. R. Middleton, Education Offices, Middlesbrough.

New Zealand.—WELLINGTON.—28th July. Post and Telegraph Department. Supply of forty-five electric alarm relays. (C.R.E. 19853/53. Ten/6592.)*

Prestwich.—18th July. Corporation. Street lighting equipment. (See this issue.)

South Africa.—JOHANNESBURG.—25th June. South African Railways. Axial flow exhaust fans for Durban (tender No. F.6404), and exhaust fan and dust collecting unit for Koedoespoort (tender F.6506). (C.R.E. 19691/53. Ten/6584.)*

CAPE TOWN.—26th June. Provincial Administration, Cape of Good Hope. Fluorescent tubes, starters and electric lamps. (C.R.E. 19519/53. Ten/6564.)*

Southport. — 11th July. Town Council. Electric lighting and heating work in connection with erection of eight shops and maisonnettes on the Heathfield Road estate. Borough architect, Lord Street.

Thailand. — BANGKOK. — 30th June. Royal Thai Irrigation Department. Supply of eight electric motors. (C.R.E. 19688/53. Ten/6569.)*

Thornaby-on-Tees. — 27th June. Town Council. Installation of electricity in 346 Council houses and shops at present served only by gas. P. Brown, borough engineer, Town Hall.

Tyrone.—29th June. County Education Committee. Electrical installations in two new schools at Drumquin and Castletown. Munce & Kennedy, chartered accountants, 133, University Street, Belfast.

ORDERS PLACED

Doncaster.—Estates and Housing Committee. Recommended. Extension of contract for electrical installations in a further 69 houses on the Cantley estate.—F. Sinclair, Ltd.

Gosforth (Northumberland). — U.D.C. Electrical installations in 32 houses, Whalton Avenue, Gosforth (£1,445).—A. McLean Brown. Lighting of High Street and Station Road, Gosforth: Lanterns, lamps, etc. (£2,073), extension brackets (£342) and time switches (£605).—General Electric Co., Ltd.

Middlesbrough.—Town Council. Installation of a lift at Holgate Institution (£1,480).—Austin Lifts, Ltd.

Peterborough.—Corporation Estates Committee. Accepted. Electrical installations in 60 houses on the Dogsthorpe North housing estate (£1,407).—M. F. Hansen.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Altrincham.—Ten shops, Broomwood estate; borough surveyor.

Birmingham.—Rebuilding factory at Camphill, Birmingham, for Albion Engineering Co., Ltd.; Harry Bloomer & Son, architects, 73, Hagley Road, Edgbaston, Birmingham.

Blaby. — Cornish-type flats (68); R.D.C. architect, Blaby, Leics.

Blackburn.—First stage of new technical college; Wm. Livesey & Sons, Ltd., Nova Scotia, Blackburn.

Blyth.—New factory for Town Tailors, Ltd., Leeds.

Brierley Hill.—Houses, Forge Lane, Wallheath (85), Harrison Road, Brierley Hill (121), Tack Farm, Wordsley (111), and Lower Bromley (45); U.D.C. surveyor.

Bristol.—Three-storey shop premises, Horsefair and Lower Arcade; A. Down, architect, 18, St. Augustine's Parade.

Calne.—Grammar school at Wessington; F. I. Bowden, county architect, County Hall, Trowbridge.

Crook (Co. Durham).—Houses (100), Wheatbottom site, for U.D.C.; Page, Son & Hill, architects, 75, King Street, South Shields.

Croydon.—Works, Beddington Lane; Amalgamated Paper Industries, Ltd., Warminster Road, S.E.25.

Daventry.—Development of estate at Braunston Road for over 100 houses; town clerk, Moot Hall.

Durham.—Police houses, Firth Moor, Darlington (13), Houghton-le-Spring (2), Belmont, Durham (14) and Dipton (2); county architect, Court Lane, Durham.

Six shops and four flats on Sunderland Road estate; city engineer, Town Hall.

Easington (Durham).—Houses at Wheatley Hill (34), South Hetton (20) and Murton (36); R. Lumsden, R.D.C. surveyor.

Eastbourne.—Dwellings (60), Langney Village estate; borough engineer.

Edinburgh.—Police station at Portobello; city architect, City Chambers.

Enfield.—Houses and flats (52), Bycullah House estate; F. Lee, U.D.C. surveyor, 7, Little Park Gardens.

Felling (Co. Durham).—Shops and offices, High Street, for Montague Burton, Ltd., tailors, Hudson Road Mills, Leeds; own architects.

Gateshead.—Factory on Team Valley trading estate for Robert Hirst & Co., clothiers, Hammerton Street, Bradford.

Gloucestershire. — Additional accommodation at Kingswood Secondary Modern School; county architect, Shire Hall, Gloucester.

Letchworth. — Works extensions; Camco (Machinery), Ltd., Icknield Way.

London.—CAMBERWELL.—Works extensions; Fortiphone, Ltd., New Church Road, S.E.5.

CITY.—Office block, Great Tower Street; Stephenson Clarke, Ltd., 4, Fenchurch Avenue, E.C.3.

Lowestoft. — Flats (36), Raglan Street; borough surveyor.

Factory and canteen, Raglan Street; Bally's Shoe Factories (Norwich), Ltd., Queen Street, Norwich.

Maidstone.—Factory and canteen, Boxley Road; Sussex Crumpets, Ltd., 74, Bennett Road, Brighton.

Mansfield.—Mills, Botany Avenue; Mansfield Hosiery Mills, Ltd.

Office premises; Fletcher & Co., Ltd., Forest Avenue.

Houses (53), Ladybrook estate; borough surveyor.

Middlesbrough.—Factory additions, South Bank Road, for North-Eastern Trading Estates, Ltd.; Matkin & Hawkins, architects, Barclays Bank Chambers, Fawcett Street, Sunderland.

Houses (84), Park End; borough engineer.

Morpeth.—Abbatoir to serve the East Northumberland area; F. R. Perkins, borough surveyor, Town Hall.

Newbiggin (Northumberland).—Houses (300) at Newbiggin Moor for the U.D.C.; H. S. Robson, surveyor.

Newcastle-on-Tyne. — Additions to the Cremona Confectionery Works; C. S. Errington, architect, 46, Grainger Street.

Five-storey flats in Elswick Street for the City Council; city architect, 18, Cloth Market.

Newport (I.O.W.).—Powdering, bottling and cold storage buildings; Isle of Wight Creameries, Ltd., Mill Street.

Peterborough.—Works offices, River Bridge area; Mitchell Engineering Constructions, Ltd., Peterborough.

Richmond (Yorks).—Maternity and child welfare centre with health office and nurses' home (£17,220); county architect, County Hall, Northallerton, Yorks.

Sunderland.—Factory (65,000 sq ft) for the Bristol Aeroplane Co., Ltd.; Middleton & Co. (Blackpool), Ltd., builders, Grange Road, Darlington.

Junior and infants' school at Hylton Red House; borough architect, Grange House, Stockton Road, Sunderland.

Uttoxeter. — Adaptations at Dove Leys, Rochester, with staff houses, equipment, etc. (£17,300), to form school for delinquent boys; Staffs Education Department, Green Hall, Lichfield Road, Stafford.

Wakefield.—Three-storey flats at Son Lane; city architect.

Washington (Durham).—Pithead baths at Glebe Colliery; George Gradon & Son, builders, North Road, Durham.

Willesden.—Factory extension; Mackie, Todd & Co., Ltd., Whitby Avenue, N.W.10.